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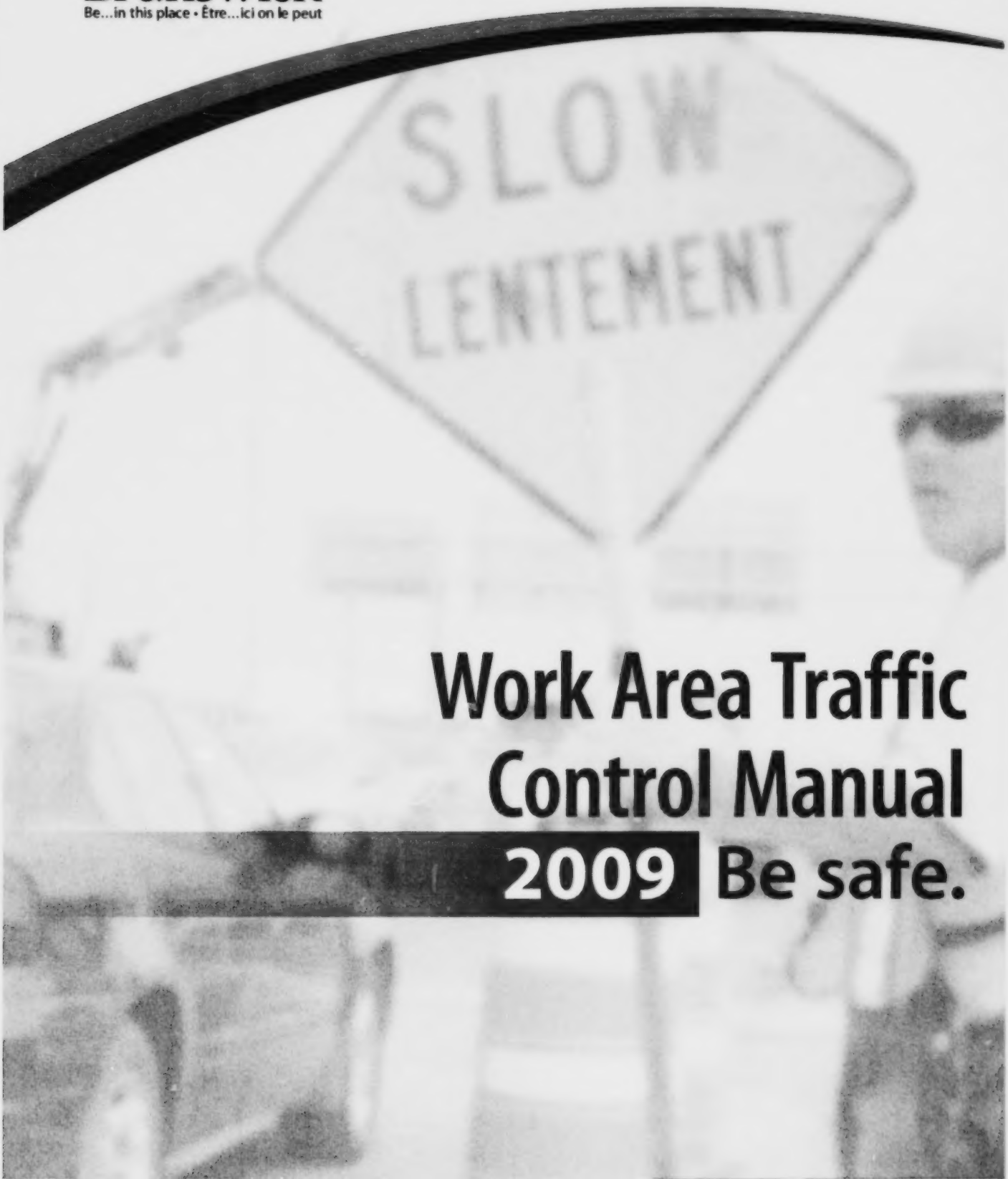

Work Area Traffic Control Manual

2009 Be safe.

To: Work Area Traffic Control Manual Holder

The Work Area Traffic Control Manual (WATCM) provides a uniform set of traffic control guidelines for all work carried out on New Brunswick provincial roads. Any work that occurs within the right-of-way of a provincial road must conform to the guidelines prescribed by this manual.

This version of the WATCM is effective as of **Monday May 4, 2009**. If you have any questions in regards to the content of the Manual, please contact the New Brunswick Department of Transportation's Maintenance and Traffic Branch at 506-453-2924.

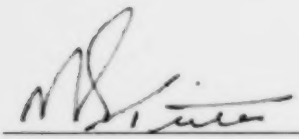

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Table of Contents

Definitions ii

1 General Information 1
- 1.1 Introduction 1
- 1.2 Legal Authority 1
- 1.3 Planning & Preparation 1
- 1.4 Responsibility 2
- 1.5 Technical Judgement 2

2 Fundamental Principles of Work Area Traffic Control 3
- 2.1 Traffic Control Principles 3
- 2.2 Work Area Speed Control 4
- 2.3 Work Area Components 5
- 2.4 Activity Area Lengths 8
- 2.5 Intersecting Roads 8
- 2.6 Night Work 8
- 2.7 Urban Area Work 9

3 Traffic Control Devices 10
- 3.1 Traffic Control Signs 10
- 3.2 Variable Message Signs 24
- 3.3 Radar Speed Display Signs 24
- 3.4 Flashing Arrow Boards 25
- 3.5 Flashing Lights 26
- 3.6 Traffic Control Signals 26
- 3.7 Delineation Devices 27
- 3.8 Temporary Pavement Markings 28
- 3.9 Barricades 29
- 3.10 Barriers 30
- 3.11 Buffer Vehicles 31
- 3.12 Pilot Vehicles 31

4 Installation and Inspection of Traffic Control Devices 32
- 4.1 Sign Installation 32
- 4.2 Setup and Removal Procedures 34
- 4.3 Inspection and Documentation 44
- 4.4 Quality Guidelines 45

5 Work Area Personnel 48
- 5.1 Traffic Control Agents 48
- 5.2 Traffic Control Persons 49
- 5.3 Dedicated Traffic Observers 52
- 5.4 Device Installers 52
- 5.5 Other Workers 52

6 Selecting the Appropriate Traffic Control Layout 53
- 6.1 Work Location 53
- 6.2 Work Duration 54
- 6.3 Traffic Volumes 54
- 6.4 Vehicle Speeds 54

7 Typical Layouts for Two Lane Roads 55

8 Typical Layouts for Multilane Roads 89

Definitions

AADT: Average Annual Daily Traffic expressed in terms of vehicles per day.

Active: a term used to describe the Activity Area when work is being carried out at the present time.

Activity Area: the component of a Work Area where the actual construction, maintenance, or utility work occurs.

Advance Warning Area: the component of a Work Area where road users are first alerted about upcoming road work.

Approach Area: the component of a Work Area where road users are given final warning about road work, and are informed of what action(s) to take.

ASTM: designation of the American Society for Testing and Materials.

Barricade: a device which provides a visual indicator of a lane or road closure.

Barrier: a device or series of devices through which a vehicle would not normally pass, intended to prevent Errant Vehicles from entering the Activity Area.

Buffer Area: the component of a Work Area that provides recovery space for Errant Vehicles.

Buffer Vehicle: a truck equipped with a Truck Mounted Attenuator (TMA) positioned in advance of workers to provide protection from Errant Vehicles.

Construction Zone: a portion of the Work Area where double fines are enforceable.

Dedicated Traffic Observer: an individual whose sole responsibility is to monitor approaching traffic and warn workers of potential hazards.

Delineation Devices: devices used to clearly highlight the traffic's path through a Work Area.

Detour: where traffic must depart completely from the original road and follow another road to bypass a Work Area.

Device Installer: any individual directly involved with the setup and removal of Traffic Control Devices in a Work Area.

Diversion: where traffic must deviate from its normal path to bypass an Activity Area.

Double Posting: the practice of placing signs on both sides of the road.

Errant Vehicles: a vehicle that strays from its designated path and travels in an uncontrollable or unpredictable manner.

Flashing Arrow Board (FAB): an electronic sign with a group of lights capable of displaying directional arrows (arrow mode) or a horizontal line (caution mode).

Lane Closure: work that is carried out in a travelled lane that reduces the remaining useable width of one or more lanes below 2.5 m.

Long Duration: work that occupies a fixed location for longer than 1 day.

Low Volume Road: a road with an AADT of less than 300 vehicles per day.

Moving Operations: work that is either done *continuously*, usually at slow speeds, or *intermittently*, with brief stops related to the work.

NCHRP: designation of the National Highway Cooperative Research Program.

Partial Lane Closure: work that is carried out in a travelled lane without reducing the remaining useable lane width below 2.5 m.

Passive: a term used to describe the Activity Area when work is temporarily stopped, yet the road has not returned to its normal operating conditions.

Pilot Vehicle: a vehicle used on two lane roads to guide road users through a one lane section of a long or complex Work Area.

Radar Speed Display Sign (RSDS): a special type of Variable Message Sign equipped with a radar unit that displays an approaching vehicle's speed back to the driver.

Roadside Work: work that is carried out within 15 m of the travelled lanes, but outside the shoulder area.

Short Duration: work that occupies a fixed location for longer than 30 minutes, yet less than 1 day. At the end of each day, the road is restored to its normal condition.

Shoulder Work: work that is carried out on the shoulder area of a road, yet which does not encroach on the travelled lanes.

Termination Area: the component of a Work Area where traffic may return to its normal path and driving conditions.

Traffic Control Agent: an individual having overall responsibility for traffic control in a Work Area.

Traffic Control Device: refers to any sign, Flashing Arrow Board, Barrier, Barricade, Delineation Device, pavement marking, or vehicle used to control traffic in a Work Area.

Traffic Control Person (TCP): an individual used in a Work Area to regulate traffic and prevent conflicts between vehicles and Work Area activities.

Traffic Control Plan: a plan prepared in advance of commencing work that addresses all aspects of traffic control in the Work Area.

Trail Vehicle: a truck that travels either on the shoulder or in the travelled lane, used to provide additional warning of upcoming work. A Trail Vehicle equipped with a TMA is a Buffer Vehicle.

Transition Area: the component of a Work Area where traffic must deviate from its normal path to proceed safely past the work.

Transition Taper: the gradual narrowing of a lane using Delineation Devices to direct traffic from its normal alignment to the path around the Work Area.

Truck Mounted Attenuator (TMA): an energy absorbing device, either mounted directly on the rear of a Buffer Vehicle or hauled on a trailer behind it, that satisfies the requirements of NCHRP 350 Test Level (TL)-3.

Variable Message Sign (VMS): an electronic sign capable of displaying a single fixed message or a number of sequential messages to provide road users with additional information about upcoming road work.

Very Short Duration: work that occupies a fixed location for less than 30 minutes, including the time required to setup and remove Traffic Control Devices.

Work Area: the entire length of road affected by construction, maintenance, or utility work, from the first advance warning sign to where the road is restored to its normal conditions.

Work Vehicle: any vehicle used to facilitate construction, maintenance, or utility work in a Work Area.

1 General Information

1.1 Introduction

The *Work Area Traffic Control Manual* (WATCM) provides a uniform set of traffic control guidelines for all work carried out on New Brunswick provincial roads. Any work that occurs within the right-of-way of a provincial road must conform to the guidelines prescribed by this manual, effective May 4th, 2009, which supercedes all previous versions.

The WATCM is meant to be a practical guide that assists the user in identifying the appropriate level of traffic control necessary for a particular activity or situation. Unless otherwise stated, the WATCM depicts the minimum level of traffic control required. It sets forth basic principles and prescribes guidelines for the design, application, installation, maintenance, and removal of the various types of Traffic Control Devices approved for use in New Brunswick. A number of illustrations of common traffic control layouts are also included. Snow removal activities are not covered in the WATCM.

The traffic control layouts contained in this manual cannot possibly cover all of the different scenarios that may occur. In cases where the user is unsure of which traffic control layout should be applied, they shall consult with their supervisor, or contact the Department of Transportation's Maintenance and Traffic Branch.

1.2 Legal Authority

The WATCM provides specific guidelines on the erection and placement of work area traffic control devices on provincially designated roads in the province of New Brunswick and is supplementary to the Manual of Uniform Traffic Control Devices Canada (MUTCDC). Individuals engaged in work within the Right of Way of provincially designated roads are expected to utilize and comply with the WATCM.

The WATCM shall also be applied where the guidelines are referenced in contract documents and agreements between Contractors and the New Brunswick Provincial Government.

1.3 Planning & Preparation

Traffic Control Plans

Planning for traffic control in Work Areas is very important. Before any maintenance, construction, or utility work can begin on a provincial road, a *Traffic Control Plan* shall be prepared that addresses the following items as a minimum:

- Required devices, including placement and location (WATCM typical layout);
- Traffic Control Persons (where needed);
- Setup and removal procedures; and
- Public advisory notices (where applicable).

A Traffic Control Plan can vary in detail depending on the complexity and location of the work. In many cases, a simple reference to a typical layout contained in this manual may be adequate. However, for complex situations or special projects, a more detailed design will be required. Any user who is unsure of the level of detail required by the Traffic Control Plan should contact the Department of Transportation's Maintenance and Traffic Branch.

Site Visits

Site visits are also an important part of the planning process. It is highly recommended that a site visit be carried out prior to preparing the Traffic Control Plan to identify:

- Traffic volumes and speeds;
- Sight distance limitations;
- Sidewalks or other pedestrian routes;
- Conflicts with driveways or intersecting roads;
- Existing signs which may need to be removed or covered;
- The amount of shoulder space available; and
- Any other condition that may impact traffic control in the Work Area.

The findings from the site visit will assist in preparing the Traffic Control Plan.

Public Advisory Notices

Public advisory notices are an effective means of alerting road users and pedestrians of planned roadwork activities, thus giving them the opportunity to adjust their travel schedule or choose an alternate route. Public advisory notices shall be issued by the New Brunswick Department of Transportation (or whoever has jurisdictional authority over the road) in advance of any projects where significant delays (longer than 15 minutes) are expected, or where traffic will be detoured as a result of a road closure.

1.4 Responsibility

Each Work Area shall have a *Traffic Control Agent* who is responsible for the Traffic Control Plan. The specific duties of the Traffic Control Agent are described in Section 5.1 of this manual.

1.5 Technical Judgement

Every Work Area presents its own unique and varying conditions that may not be specifically covered in this manual. These conditions must be addressed on a project by project basis by applying sound technical judgement.

The decision of whether to use a particular device at a particular location must consider the local conditions in the Work Area. Although this manual provides guidelines for the design and application of Traffic Control Devices, it is not a substitute for technical judgement. It is acceptable for a Traffic Control Agent to make changes to the Traffic Control Plan to adjust to local conditions, providing technical judgement is used and safety is not diminished. If there are questions in regards to specific issues, the Department of Transportation's Maintenance and Traffic Branch may be contacted for guidance.

2 Fundamental Principles of Work Area Traffic Control

Work Areas can often present road users and pedestrians with unexpected or unfamiliar situations. Special care should be taken when applying traffic control to ensure that users are provided with sufficient information to proceed through the Work Area in a safe and efficient manner. In doing so, it will enhance safety for the travelling public and workers.

2.1 Traffic Control Principles

Traffic safety in Work Areas must be a high priority and integral part of every project, beginning from the planning stage through to project completion. Work activities must be planned and conducted with the safety of road users and workers kept in mind at all times. The following fundamental principles have been shown to enhance safety in Work Areas and form the basis for the guidelines contained in this manual:

1. **Traffic movement should be inhibited as little as possible**.

   - Avoid, where possible, changes in traffic patterns such as narrowing lanes, dropped lanes, or any other roadway transitions that require rapid manoeuvres;
   - Provide for the safe operation and movement of Work Vehicles on site, particularly on high speed, high volume roads;
   - Minimize construction time to reduce exposure to potential hazards;
   - Avoid, where possible, scheduling work activities that affect traffic flow during peak traffic hours (typically 6am-9am and 4pm-6pm) on roads near urban areas that carry high volumes of commuter traffic;
   - Minimize the length of road affected by work; and
   - Limit the use of reduced speed zones to locations where a clearly demonstrated need exists.

2. **Road Users and pedestrians shall be guided in a clear, consistent, and positive manner while approaching and travelling through the Work Area.**

   - Provide adequate warning, delineation, and channelization by means of proper signing, pavement markings, or any other Traffic Control Devices as prescribed by this manual;
   - Place Traffic Control Devices where they do not pose a hazard to road users or pedestrians;
   - Remove / cover any existing pavement markings or signs that might either confuse or mislead the road user;
   - Give pedestrians special consideration, especially when the Activity Area encroaches on a sidewalk or crosswalk.

3. **Routine inspections of traffic control shall be performed.**

    - Ensure that all individuals responsible for traffic control have received the required training as prescribed by Section 5 of this manual;
    - Verify that all Traffic Control Devices conform to the Traffic Control Plan;
    - Immediately modify traffic control to accommodate changes in traffic or working conditions;
    - Verify the effectiveness of traffic control under a variety of light and weather conditions to ensure acceptable visibility (including at night);
    - Perform inspections on holidays, weekends, and other times when a Long Duration Work Area is not Active;
    - Check that all Traffic Control Devices are kept clean, visible, and in good repair. Devices that are damaged or defaced should be replaced as quickly as possible;
    - Document at least two times per day the location of all Traffic Control Devices, including any changes that have been made to accommodate prevailing conditions; and
    - Remove or cover all Work Area Traffic Control Devices when no longer applicable.

It should be noted that for activities requiring a worker to be in a travelled lane for only a very brief period, a Dedicated Traffic Observer may be used instead of warning signs, provided the worker can easily clear the lane when a vehicle approaches. An example of such an activity may include removing debris from the road. If debris is discovered that poses an immediate safety threat to road users, then it may be removed without a Dedicated Traffic Observer, provided it only requires a momentary pause in the roadway.

2.2 Work Area Speed Control

Most drivers will only reduce their speeds if they see a clearly demonstrated need to do so. If the speed reduction is perceived to be unwarranted, it will often be disregarded by the driver. For this reason, it is recommended that reduced speed zones be limited to locations where restrictive features or unsafe conditions are present. Examples of such locations may include narrowed travel lanes, unpaved road surfaces, or where the road deviates from its normal alignment (Diversions). Where speed reductions are used, signs shall also be erected to notify road users when the original speed limit has been reinstated.

If reduced speed zones are to be used, the Traffic Control Plan shall be adequately designed so that vehicles can travel safely through the Work Area without reducing their speed by more than 20 km/h. Research has shown that large reductions in the posted speed limit result in greater variation amongst vehicle speeds, which in turn increases the potential for rear-end collisions. Speed reductions greater than 20 km/h must be approved by the Department of Transportation's Maintenance and Traffic Branch.

Where speed management is a particular concern in Work Areas, the Traffic Control Plan may incorporate additional speed reducing strategies such as 1) selective target enforcement by RCMP or local police, or 2) using a radar speed display sign. Any other speed management strategies must be approved by the Department of Transportation's Maintenance and Traffic Branch.

2.3 Work Area Components

A *Work Area* includes the entire length of road beginning from the first advance warning sign through to the last Traffic Control Device, where traffic may return to its normal operating conditions. A well-designed Work Area has seven components, as illustrated in Figure 2-1:

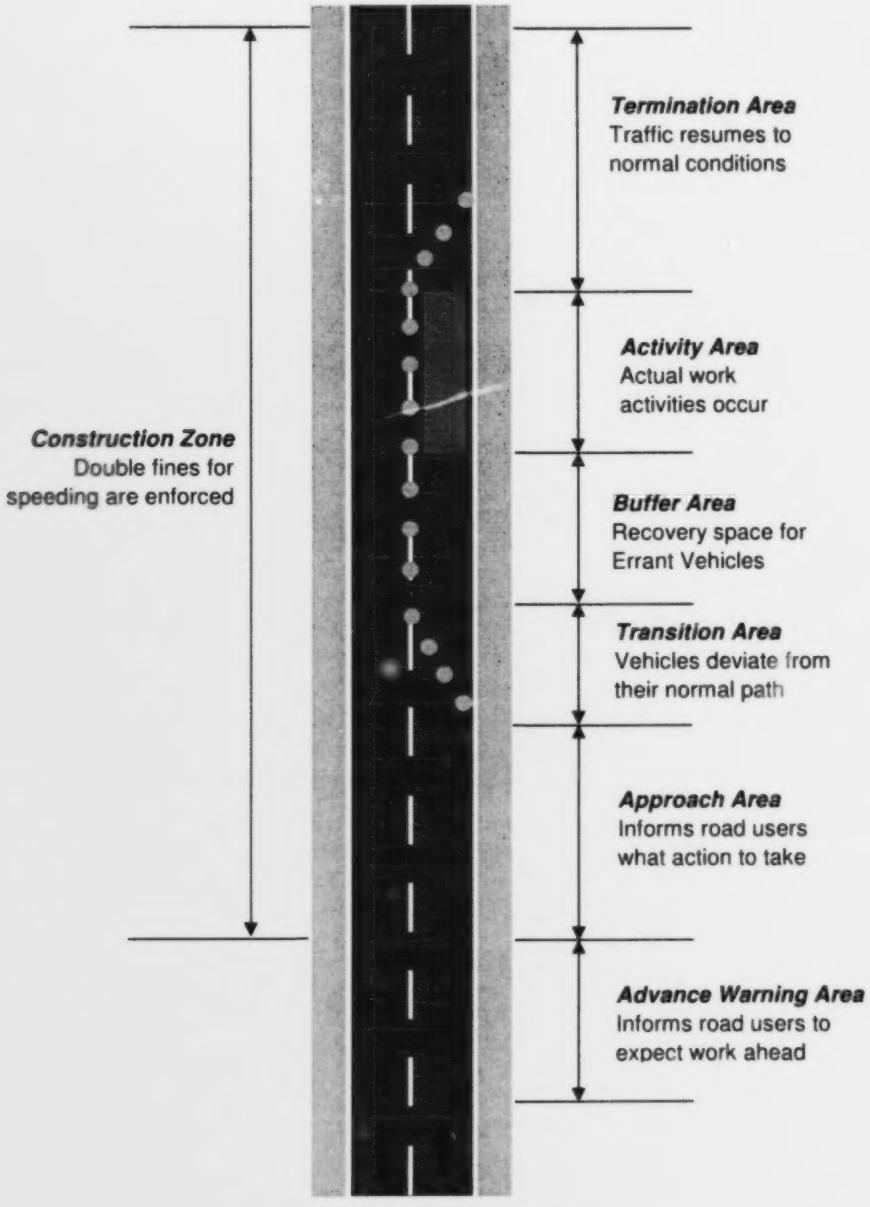


Figure 2-1: Components of a Work Area

Advance Warning Area

The Advance Warning Area is where road users are first alerted about upcoming road work. This is typically achieved by a Construction Ahead sign. The length of advance warning required will vary depending on the posted speed of the roadway and the degree to which the work interferes with traffic.

Unless otherwise indicated on a typical layout, Table 2-1 shows the minimum advance warning distances that shall be provided for various posted speed limits. This distance is measured from the Construction Ahead sign to the start of the Transition Area. Supplementary Traffic Control Devices may be erected to provide additional advance warning in Work Areas where significant queuing occurs.

Table 2-1: Minimum Advance Warning Distances

Normal Posted Speed Limit (km/h)	Minimum Advance Warning Distance (m)
50	300
60 - 70	300
80 - 90	500
100 - 110	1000

Approach Area

The Approach Area is where road users receive final warnings of upcoming construction or maintenance activities and are informed of what action(s) to take. Such actions typically include lane changes, speed reductions, or passing restrictions. This information must be presented to road users at a sufficient distance so they can adjust to the altered situation before reaching it. The start of the Approach Area also corresponds to the start of the Construction Zone.

Transition Area

The Transition Area is where road users deviate from their normal path to safely proceed past the work. Not every Work Area will contain a Transition Area, as they are only used when work encroaches on one or more of the travelled lanes. Road users are typically guided by a Transition Taper, delineated by flexible drums. Minimum Transition Taper lengths are shown in Table 2-2.

Table 2-2: Minimum Transition Taper Lengths

Normal Posted Speed Limit (km/h)	Minimum Taper Length (m)	Minimum Number of Delineators
50	30	5
60 - 70	64	8
80 - 90	110	11
100 - 110	180	10

With the exception of Flashing Arrow Boards and Barricades used to emphasize the Lane Closure, it is imperative that no work materials, vehicles, or equipment be stored or parked in the Transition Area.

Buffer Area

The Buffer Area provides recovery space for Errant Vehicles which may fail to properly manoeuvre through the Transition Area (where required). It is typically delineated by proper Delineation Devices. For Moving Operations, the Buffer Area is the space between the Buffer Vehicle and the Work Vehicle. With the exception of Truck Mounted Attenuators, the Buffer Area shall remain clear of all materials, vehicles, and equipment. Minimum Buffer Area lengths are contained in Table 2-3.

Table 2-3: Minimum Buffer Area Lengths

Normal Posted Speed Limit (km/h)	Minimum Buffer Area Length (m)
50	35
60 - 70	50
80 - 90	65
100 - 110	75

Activity Area

The Activity Area is where the actual construction, maintenance, or utility work occurs. All materials, vehicles, and equipment are to be stored in this area.

The Activity Area can either be:

Active... when work is being carried out at the present time; or

Passive... when work is temporarily stopped, yet the road has not returned to its normal operating conditions (i.e. during overnight hours and lunch time).

The Traffic Control Agent shall ensure that both Active and Passive Activity Areas are inspected for compliance to this manual in the same manner.

Termination Area

The Termination Area is where traffic makes the transition back to the normal path of the road. It extends from the end of the Activity Area to a point where traffic is able to resume normal driving. The end of the Termination Area is denoted by the Construction Zone Ends sign. On two lane roads, the Construction Zone Ends sign is placed directly across from the Construction Zone Begins sign on the other approach.

Construction Zone

The Construction Zone refers to a portion of the Work Area that includes the Approach, Transition, Buffer, Activity, and Termination Areas. Its boundaries are clearly identified by a Construction Zone Begins sign and a Construction Zone Ends sign. Enforcement officials have the authority to issue double fines for speeding in a Construction Zone when workers are present.

2.4 Activity Area Lengths

A fundamental principal of traffic control is to minimize the length of road affected by work. The longer the Work Area, the more road users will be delayed and thus become frustrated.

Unless otherwise stated in the typical layouts, the maximum length of an Activity Area shall not exceed 2 km on a two lane road and 4 km on a multilane road (Note: This does not apply to Moving Operations). In special circumstances, the length of an Activity Area may be extended. This shall only be permitted upon consultation with the Department of Transportation's Maintenance and Traffic Branch.

2.5 Intersecting Roads

Advance warning shall be provided on all secondary roads that intersect the Work Area and, as a minimum, shall consist of a Construction Ahead sign displaying the appropriate directional arrow. Depending on where the road intersects the Work Area, additional signage may be required to provide road users with pertinent information. The Traffic Control Agent is responsible for determining which additional signs are required.

2.6 Night Work

Additional consideration is required whenever work is carried out at night (½ hour before sunset and ½ hour after sunrise). Road users must be provided with the same level of warning at night as during the day. This means all devices and personnel must be clearly visible during hours of darkness. The minimum retro-reflectivity standards for all Traffic Control Devices and personal protective equipment contained in this manual have been selected to allow for adequate visibility at night. However, additional warning devices, such as flashing amber beacons, may be used to enhance visibility where deemed necessary.

The following additional safety measures shall be applied whenever work is carried out at night:

- All Traffic Control Devices shall be inspected during hours of darkness to ensure adequate visibility;
- Traffic Control Persons, if used, shall wear white coveralls under their safety vests and shall carry a flashlight with a semi-transparent red cone;
- Hard hats shall have at least 80 cm^2 of reflective material visible from all sides;
- Work vehicles shall not turn around in the Work Area to avoid confusing other road users; and
- Minimum illumination shall be provided as per the following section.

Illumination

Illumination shall be provided for all night work. Luminaires shall be installed so they are oriented between 45 and 90 degrees away from the flow of traffic. Under no circumstances shall lights be aimed at, or spill over onto, oncoming traffic.

Luminaires shall be of sufficient wattage and quantity to provide a minimum horizontal illuminance as depicted in Table 2-4.

Table 2-4: Minimum Illumination Requirements

Illuminance Level	Minimum Average Illuminance (Lux)	Minimum Point Illuminance (Lux)
1	60	30
2	110	80
3	220	N/A

A minimum Level 1 illuminance shall be provided in any portion of the Work Area where personnel are present. Traffic Control Persons shall be illuminated from above with a minimum Level 3 illuminance.

Minimum illuminance requirements for other special operations are as follows:

For paving operations:

Level 2 – 15 m ahead of the paver/MTV and 30 m behind the paver.

Level 1 – 120 m ahead to 250 m behind the paver.

For milling operations:

Level 2 – 15 m ahead and 15 m behind the milling machine.

Level 1 – 120 m ahead to 250 m behind the milling machine.

Measurement of illuminance shall be taken at the road surface, in a uniform pattern spaced at 5 m throughout a representative test area. The Traffic Control Agent shall check illumination levels in Work Areas each time a change in lighting configuration is made and at least once overnight.

2.7 Urban Area Work

Work Areas in urban environments are usually characterized by:

- Lower speeds (typically 50 km/h);
- Higher traffic and pedestrian volumes;
- More frequent driveways and intersections;
- Space limitations; and
- Increased roadside signage.

Each of these factors must be considered when preparing a Traffic Control Plan for work in an urban environment. The typical layouts contained in Sections 7 and 8 of this manual provide guidance with respect to device spacing on lower speed roads.

3 Traffic Control Devices

Traffic control in a Work Area is achieved using a combination of Traffic Control Devices. It is important that a consistent standard for these devices be applied in all Work Areas.

This chapter provides a listing of Traffic Control Devices approved for Work Areas on provincial roads in New Brunswick. All devices must be of the same shape, colour, sheeting, and minimum dimensions specified, as well as bear the exact message or lettering shown. All other devices must be approved by the Department of Transportation's Maintenance and Traffic Branch.

3.1 Traffic Control Signs

Traffic control signs are used in Work Areas to 1) warn approaching road users about upcoming roadway construction or maintenance activities, and 2) provide them with instructions for manoeuvring safely past the Activity Area.

Sheeting
All signs shall be constructed of high intensity sheeting that conforms to an ASTM D4956 Type III / Type IV standard.

Schedule of Signs
The following schedule of traffic control signs has been approved by the Department of Transportation for use on provincial roads in New Brunswick. The reference numbers that accompany each sign refer to the Department of Transportation's Sign Catalogue. Custom signs (those not contained in the catalogue) require approval from the Department of Transportation's Maintenance and Traffic Branch for use on provincial roads.

Sign Size
Unless otherwise noted in this manual, the sign sizes in Table 3-1 are the minimum which shall be used for the corresponding speeds shown.

Table 3-1: Minimum Sign Sizes

Normal Posted Speed Limit (km/h)	Minimum Sign Size
50	75 cm x 75 cm
60 - 90	90 cm x 90 cm
100 - 110	120 cm x 120 cm

However, for Short Duration Work, 90 cm x 90 cm signs may be used for roads with speeds of 100-110 km/h in all areas except the Advance Warning Area. In the Advance Warning Area, the signs shall still be 120 cm x 120 cm.

Construction Ahead

Description: The *Construction Ahead* sign warns road users of upcoming construction or maintenance activities. It is commonly the first sign that road users encounter as they approach the Advance Warning Area. The appropriate sign shall be used depending on the location of the work.

Minimum Size:

50 km/h	75 cm x 75 cm (#4300-S / #4347-L / #4344-R)
60 - 90 km/h	90 cm x 90 cm (#4301-S / #4348-L / #4345-R)
100 - 110 km/h	120 cm x 120 cm (#4303-S / #4349-L / #4346-R)

Colour / Sheeting: Black on Orange, High Intensity

Road Work

Description: The *Road Work* sign indicates that construction or maintenance activities are occurring ahead and that *workers or equipment are present.* **This sign must be removed or covered when no workers or equipment are present.**

Minimum Size:

50 km/h	75 cm x 75 cm (#4364)
60 - 90 km/h	90 cm x 90 cm (#4366)
100 - 110 km/h	120 cm x 120 cm (#4368)

Colour / Sheeting: Black on Orange, High Intensity

Survey Crew

Description: The *Survey Crew* sign indicates that a survey crew is working on or near the travelled portion of the road. **This sign must be covered or removed when work is not in progress.**

Minimum Size:

50 km/h	75 cm x 75 cm (#4594)
60 - 90 km/h	90 cm x 90 cm (#4596)
100 - 110 km/h	120 cm x 120 cm (#4598)

Colour / Sheeting: Black on Orange, High Intensity

Traffic Control Person Ahead

Description: The *Traffic Control Person Ahead* sign indicates that a Traffic Control Person (TCP) is directing traffic using a stop/slow paddle. **This sign must be covered or removed when the TCP is not directing traffic.**

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4604)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4606)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4607)

Colour / Sheeting: Black on Orange, High Intensity

Lane Closed Ahead

Description: The *Lane Closed Ahead* sign is used on multilane roads to indicate that a lane is closed for road work. The appropriate sign must be used depending on whether the left lane or the right lane is closed.

Minimum Size:
50 km/h . . . . . .75 cm x 75 cm (#4370-L / #4375-R)
60 - 90 km/h . . . . . 90 cm x 90 cm (#4371-L / #4376-R)
100 - 110 km/h . . . . . 120 cm x 120 cm (#4373-L / #4378-R)

Colour / Sheeting: Black on Orange, High Intensity

Road Narrows

Description: The *Road Narrows* sign indicates a reduction in available road width, but not a reduction in the number of lanes. Road users are warned to expect a narrowing of their driving lane or a reduction in shoulder clearance. The appropriate sign must be used depending on whether the road narrows on the left, the right, or on both sides.

Minimum Size:
50 km/h . . . . . .75 cm x 75 cm
(#4398-L / #4399-R / #4383-B)
60 - 90 km/h . . . . . 90 cm x 90 cm
(#4387-L / #4388-R / #4379-B)
100 - 110 km/h . . . . . 120 cm x 120 cm
(#4386-L / #4389-R / #4380-B)

Colour / Sheeting: Black on Orange, High Intensity

Road Diversion

Description: The *Road Diversion* sign indicates a minor deviation from the normal path which is 200 m or less. The appropriate sign must be used depending on whether the traffic is diverted to the right or left.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4160-L / #4159-R)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4161-L / #4166-R)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4167-L / #4172-R)

Colour / Sheeting: Black on Orange, High Intensity

Road Realignment

Description: The *Road Realignment* sign indicates a deviation from the normal path which is 200 m or greater. The appropriate sign must be used depending on whether the traffic is realigned to the right or left.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4144-L / #4145-R)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4162-L / #4164-R)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4163-L / #4165-R)

Colour / Sheeting: Black on Orange, High Intensity

Two-Way Traffic Ahead

Description: The *Two-way Traffic Ahead* sign warns road users currently travelling on a one-way road (typically a multilane road) that they are approaching a section of road with two-way traffic operation.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4203)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4205)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4207)

Colour / Sheeting: Black on Orange, High Intensity

Added Lane

Description: The *Added Lane* sign informs road users that two roads are about to converge and that merging movements are not required.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4208)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4209)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4210)

Colour / Sheeting: Black on Orange, High Intensity

Detour Ahead

Description: The *Detour Ahead* sign informs road users that they will be required to Detour around the Activity Area. It is to be used only when vehicles must completely depart from the original road, and not for Diversions.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4110)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4111)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4113)

Colour / Sheeting: Black on Orange, High Intensity

Barricade Ahead

Description: The *Barricade Ahead* sign warns road users that a Barricade is located ahead to mark the closure of the road.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4200)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4201)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4202)

Colour / Sheeting: Black on Orange, High Intensity

Narrow Structure

Description: The *Narrow Structure* sign indicates that a structure, such as a bridge, underpass, or overpass, is significantly narrower than the approach road.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4383)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4381)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4382)

Colour / Sheeting: Black on Orange, High Intensity

Caution

Description: The *Caution* sign warns road users of upcoming roadside hazards such as shoulder washouts or guiderail damage. It shall always be accompanied by other signs that provide road users with additional information about the hazard (e.g. Lane Narrows sign).

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4359)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4360)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4361)

Colour / Sheeting: Black on Orange, High Intensity

Pavement Ends

Description: The *Pavement Ends* sign warns road users that the paved surface ends ahead as a result of work activities.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4630)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4631)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4636)

Colour / Sheeting: Black on Orange, High Intensity

Truck Entrance

Description: The *Truck Entrance* sign indicates to drivers that they are approaching a location at which trucks are entering, leaving, or crossing the road and where an unusual manoeuvre or physical condition such as inadequate sight distance or steep grades presents an uncommon degree of hazard. In regards to construction and maintenance activities, this sign is also used in areas where there are more than 50 trucks entering, leaving, or crossing per day. However, it must be covered or removed when trucks are not working. The appropriate sign must be used depending on if the entrance is on the right or the left. The Left Truck Entrance sign shall be used at locations where trucks are crossing the road.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#4410-L / #4409-R)
60 - 90 km/h . . . . . .90 cm x 90 cm (#4416-L / #4411-R)
100 - 110 km/h . . . . . .120 cm x 120 cm (#4417-L / #4412-R)

Colour / Sheeting: Black on Orange, High Intensity

Traffic Signals Ahead

Description: The *Traffic Signals Ahead* sign indicates that traffic control signals are present in the Work Area.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#3031)
60 - 90 km/h . . . . . .90 cm x 90 cm (#3032)
100 - 110 km/h . . . . . .120 cm x 120 cm (#3033)

Colour / Sheeting: Red, Yellow, Green & Black on Yellow, High Intensity

Stop Ahead

Description: The *Stop Ahead* sign indicates that a Stop sign is present in the Work Area.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#3011)
60 - 90 km/h . . . . . .90 cm x 90 cm (#3012)
100 - 110 km/h . . . . . .120 cm x 120 cm (#3023)

Colour / Sheeting: Red & Black on Yellow, High Intensity

Yield Ahead

Description: The *Yield Ahead* sign indicates that a Yield sign is present in the Work Area.

Minimum Size:
50 km/h . . . . . 75 cm x 75 cm (#3021)
60 - 90 km/h . . . . . .90 cm x 90 cm (#3022)
100 - 110 km/h . . . . . .120 cm x 120 cm (#3023)

Colour / Sheeting: Red, White, & Black on Yellow, High Intensity

Grooved Pavement

Description: The *Grooved Pavement* sign warns bicyclists and motorcyclists of road surface conditions that require extra care and attention. This sign is typically used where milling activities occur.

Minimum Size:
50 km/h . . . . . .75 cm x 75 cm (#4550)
60 - 110 km/h . . . . . 90 cm x 90 cm (#4551)

Colour / Sheeting: Black on Orange, High Intensity

Pavement Drop-Off

Description: The *Pavement Drop-off* sign warns road users of an appreciable drop in elevation between the travelled lane and the adjacent lanes or shoulder.

Minimum Size:
50 km/h . . . . . .75 cm x 75 cm (#4565)
60 - 110 km/h . . . . . 90 cm x 90 cm (#4566)

Colour / Sheeting: Black on Orange, High Intensity

Bump

Description: The *Bump* sign warns road users of a change in the road's profile that is sufficiently abrupt to cause discomfort for passengers or deflect the vehicle from its existing course. It must be placed in advance of every bump. Where numerous bumps exist on a section of road, a supplementary tab sign may be added to indicate the length of the rough section.

Minimum Size:
50 km/h . . . . . .75 cm x 75 cm (#4626)
60 - 110 km/h . . . . . 90 cm x 90 cm (#4628)

Colour / Sheeting: Black on Orange, High Intensity

Loose Gravel

Description: The *Loose Gravel* sign warns road users of the presence of loose stone chips on the roadway caused by a recent chip seal resurfacing.

Minimum Size: 75 cm x 75 cm (#4501)

Colour / Sheeting: Black on Orange, High Intensity

Tar (#????)

Description: The *Tar* sign warns road users that a section of road has been recently primed or tack coated for chip sealing.

Minimum Size: 75 cm x 75 cm (#4511)

Colour / Sheeting: Black on Orange, High Intensity

Construction Zone Begins

Description: The *Construction Zone Begins* sign indicates that road users are now entering the Construction Zone, where double fines for speeding are enforceable.

Minimum Size: 120 cm x 90 cm (#4316)

Colour / Sheeting: Black on Orange, High Intensity

Construction Zone Ends

Description: The *Construction Zone Ends* sign indicates that road users have reached the end of the Work Area and that roadway conditions have returned to normal. It also marks the end of where double fines for speeding are enforceable.

Minimum Size: 120 cm x 90 cm (#4318)

Colour / Sheeting: Black on Orange, High Intensity

Wet Paint

Description: The *Wet Paint* sign warns road users that line painting is occurring ahead. It is to be mounted on the Trail Vehicle that follows the paint truck.

Minimum Size: 240 cm x 120 cm (#4652)

Colour / Sheeting: Black on Orange, High Intensity

Follow Me

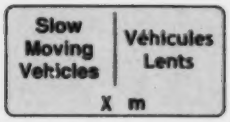
Description: The *Follow Me* sign is used to advise road users that a Pilot Vehicle will lead them through a Work Area and that the Pilot Vehicle must be followed.

Minimum Size: 240 cm x 120 cm (#4654)

Colour / Sheeting: Black on Orange, High Intensity

Slow Moving Vehicles Ahead

Description: The *Slow Moving Vehicles Ahead* sign warns road users of the possible presence of slow moving trucks that have entered the roadway and require some distance to reach a reasonable speed. This sign is to be placed in advance of all truck entrances where there are more than 200 trucks per day entering, exiting, or crossing the road.



Minimum Size: 240 cm x 120 cm (#4844)

Colour / Sheeting: Black on Orange, High Intensity

Road Closed to Thru Traffic

Description: The Road Closed to Thru Traffic sign informs road users that the road is closed a certain distance ahead, and that only local traffic may proceed.

Minimum Size: 120 cm x 175 cm (#4007)

Colour / Sheeting: Black and White on Orange, High Intensity

Stop

Description: The *Stop* sign indicates to road users that they must stop their vehicles completely before entering an intersection and not proceed until it is safe to do so.

Minimum Size: 50 km/h . . . . . .75 cm x 75 cm (#6)
60 - 110 km/h . . . . . 90 cm x 90 cm (#7)

Colour / Sheeting: White on Red, High Intensity

Yield

Description: The *Yield* sign indicates to road users that they must yield the right-of-way (stopping if necessary) before entering an intersection and not proceed until it is safe to do so.

Minimum Size: 50 km/h . . . . . .75 cm x 75 cm (#26)
60 - 110 km/h . . . . . 90 cm x 90 cm (#27)

Colour / Sheeting: White on Red, High Intensity

Passing Prohibited

Description: The *Passing Prohibited* sign indicates to drivers that they shall not overtake another vehicle within the Construction Zone.

Minimum Size: 90 cm x 90 cm (#721)

Colour / Sheeting: Black and Red on White, High Intensity

Stop Here on Red

Description: The *Stop Here on Red* sign in used in advance of traffic control signals to indicated to drivers the point at which they must stop their vehicle if the light is red.

Minimum Size: 60 cm x 60 cm (#4393)

Colour / Sheeting: Black on White, High Intensity

Maximum Speed

Description: The *Maximum Speed* sign indicates to road users the maximum legal vehicle speed permitted on the section of the Work Area where the signs are installed.

Minimum Size: 90 cm x 115 cm

(#141 for 50 km/h - See Sign Catalogue for other speeds)

Colour / Sheeting: Black on White, High Intensity

Reduced Speed Ahead

Description: The *Reduced Speed Ahead* sign warns road users that they are approaching a section of road where the maximum legal speed limit has been temporarily reduced due to work activities.

Minimum Size: 90 cm x 115 cm

(#146 for 50 km/h - See Sign Catalogue for other speeds)

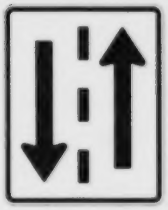
Colour / Sheeting: Black on White, High Intensity

Two-Way Traffic

Description: The *Two-Way Traffic* sign indicates to road users that the section of road on which they are travelling is a two-way road and that the normal rules for two-lane operation apply. This sign shall always be preceded by the Two-Way Traffic Ahead sign.

Minimum Size: 90 cm x 120 cm (#562)

Colour / Sheeting: Black on White, High Intensity



Temporary Pavement Marking

Description: The *Temporary Pavement Marking* sign indicates that a section of road has recently been resurfaced and does not yet have permanent pavement markings.

Minimum Size: 90 cm x 90 cm (#4581)

Colour / Sheeting: Black on White, High Intensity

End Temporary Pavement Marking

Description: The *End Temporary Pavement Marking* sign marks the end of a section of road with temporary pavement markings.

Minimum Size: 90 cm x 115 cm (#4586)

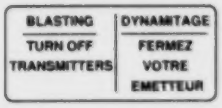
Color / Sheeting: Black on White, High Intensity

Blasting Zone

Description: The *Blasting Zone* sign warns of upcoming blasting activities and informs road users to turn off transmitting devices. It shall be placed 1 km in advance of the blast site.

Minimum Size: 240 cm x 120 cm (#4916)

Color / Sheeting: Black on White, High Intensity

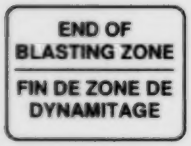


Blasting Zone Ends

Description: The *Blasting Zone Ends* sign marks the end of a blasting zone. It shall be placed 1 km downstream of the blasting area.

Minimum Size: 115 cm x 90 cm (#4921)

Color / Sheeting: Black on White, High Intensity



Road Closed

Description: The *Road Closed* sign is used in conjunction with Barricades to mark the location beyond which road users are not permitted to travel.

Minimum Size: 90 cm x 115 cm (#4021)

Color / Sheeting: Black and Red on White, High Intensity

Next x km

Description: The *Next x km* tab is used as a supplement to other traffic control signs to indicate the length of road on which a particular condition exists.

Minimum Size: 90 cm x 45 cm (#4313)

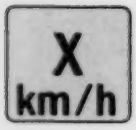
Color / Sheeting: Black on Orange, High Intensity

Advisory Speed Tab

Description: The *Advisory Speed Tab* is used as a supplement to Diversion signs to indicate the advised speed on a Diversion.

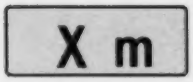
Minimum Size: 60 cm x 60 cm (#4179)

Color / Sheeting: Black on Orange, High Intensity



Distance Advisory Tab

Description: The *Distance Advisory Tab* is used as a supplement to warning signs to indicate the length of road remaining before a road user encounters a particular condition. The distance may be specified in either metres or kilometres.



Minimum Size: 75 cm x 30 cm (#4311)

Color / Sheeting: Black on Orange, High Intensity

1 Lane Tab

Description: The *1 Lane Tab* is used as a supplement to the Road Narrows sign to warn road users that the road is reduced to one lane ahead. This tab is typically used during Lane Closures on two lane roads where traffic is controlled by yield signs.

Minimum Size: 75 cm x 45 cm (#4385)

Color / Sheeting: Black on Orange, High Intensity

Detour Tab

Description: The *Detour Tab* is used in conjunction with appropriate route markers to guide road users through intersection along a Detour.

Minimum Size: 60 cm x 30 cm (#4142)

Color / Sheeting: Black on Orange, High Intensity

Detour Ends

Description: The *Detour Ends* sign informs road users that they have reached the end of a detour and are resuming travel on their original route.

Minimum Size: 90 cm x 60 cm (#4156)

Color / Sheeting: Black on Orange, High Intensity

3.2 Variable Message Signs

Variable Message Signs (VMSs) are electronic signs used to provide road users with additional information about upcoming road work. They may be used prior to or in the Advance Warning Area as a supplement to, but not a substitute for, conventional traffic signs. The Department of Transportation's Maintenance and Traffic Branch shall be contacted prior to the use of a VMS.

VMSs can be programmed to display a single fixed message or a number of sequential messages. Each message is known as a phase, and must be visible for a minimum of three seconds so approaching road users are able to read the message at least twice. The minimum letter height shall be at least 45 cm.

The following factors must be considered when designing a message for a VMS:

- Each phase should convey a single thought;
- The message should be as brief as possible;
- All messages must appear in both English and French (it is acceptable to have them programmed as sequential phases);
- Abbreviations can be used provided they are easily understood; and
- If a message is longer than two phases, additional VMSs should be used.

The following are examples of messages approved for use on New Brunswick roads: EXPECT DELAYS, REDUCE SPEED, DETOUR AHEAD, RIGHT LANE CLOSED, LEFT LANE CLOSED, and PREPARE TO STOP.

In order to achieve a high level of respect for VMSs, the messages must only provide road users with information which is directly relevant to the situation they will be encountering. Providing inaccurate or unnecessary information will cause VMSs to lose credibility.

Some applications where VMSs may be considered include locations where:

- Significant queuing or delays are expected;
- Traffic speeds are expected to drop substantially (20 km/h or greater);
- Changes in road alignment or surface condition exist; and
- Advance notice of a ramp, lane, or roadway closure is needed.

3.3 Radar Speed Display Signs

Radar Speed Display Signs (RSDSs) are a special type of VMS, equipped with a radar unit that displays an approaching vehicle's speed back to the driver. RSDSs may be used as a supplement to, but not a substitute for, conventional traffic signs in the Approach Area, where speed management is a particular concern. The Department of Transportation's Maintenance and Traffic Branch shall be contacted prior to the use of an RSDS.

RSDSs have been demonstrated in some applications to reduce 85th percentile speeds up to an additional 10 km/h over the reduction caused by conventional signs alone. For maximum effectiveness, it is desirable to supplement the RSDS with law enforcement from time to time.

Where used, RSDSs must be placed where they do not conflict with other traffic control signs and devices. To be most effective, it is recommended that the numbers on the display be at least 45 cm tall. Some models are also capable of displaying a supplementary message informing the driver to "slow down". If the display is supplemented with a text message, the same minimum requirements apply as for Variable Message Signs.

3.4 Flashing Arrow Boards

Flashing Arrow Boards (FABs) are Traffic Control Devices, either mounted on a truck or trailer, with a group of lights capable of displaying directional arrows (Arrow Mode) or a horizontal line (Caution Mode) as shown in Figure 3-1.

Arrow Left Mode **Arrow Right Mode** **Caution Mode**

Figure 3-1: Flashing Arrow Board Displays

The directional arrows are used primarily on multilane roads to direct traffic from a closed lane into the adjacent lane. The appropriate direction (left or right) must be displayed. Directional arrows may also be used on two lane roads to divert traffic to the right only. The left arrow shall never be used on two lane roads, as it may cause drivers to divert into oncoming traffic.

The caution mode may be used on both multilane and two lane roads to provide greater emphasis when:

- The location of work does not require any lanes to be closed;
- Diverting traffic to the left on a two lane road; or when
- A Traffic Control Person is directing traffic on a two lane road.

All FABs shall meet the minimum requirements shown in Table 3-2.

Table 3-2: Minimum Requirements for Flashing Arrow Boards

Normal Posted Speed Limit	Minimum Size	Minimum Height above Road	Minimum Legibility	Minimum No. of Bulbs	Flash Rate
50 – 60 km/h	120 cm x 60 cm	1.5 m	800 m	12	25 – 40 flashes per minute
70 km/h or greater	150 cm x 75 cm	1.5 m	1000 m	15	25 – 40 flashes per minute

A 35 watt incandescent bulb is the standard for FABs. Alternate bulbs such as halogen bulbs, low wattage bulbs, and light-emitting diodes (LEDs) may be used provided they maintain the same flash rate and brightness as a 35 watt incandescent bulb. All FABs used during night work shall be equipped with at least one photocell that progressively reduces light intensity during hours of darkness to prevent road users from being temporarily blinded.

3.5 Flashing Lights

360 Degree Amber Lights

All Work Vehicles stationed in a Work Area must be equipped with an amber light visible from all sides (360 degrees). This includes round or rectangular lighting devices. If the ability to view a light is obscured, other lights shall be mounted to ensure visibility on all sides. These lights shall be displayed whenever a vehicle is positioned such that it could influence traffic. Standard vehicle 4-way flashers shall not be used as a substitute.

Flashing Beacons

Flashing amber and flashing red beacons may be mounted on Barricades or other special construction signs to provide additional emphasis, particularly at night. Amber warning lights are used to indicate "caution", while red warning lights are used to indicate "do not enter". Note: beacons shall not be used on Barricades in close proximity to traffic control signals.

Flashing beacons must be at least 30 cm in diameter and maintain a flash rate of 25 to 40 flashes per minute. Electrical, solar, and battery power sources are all acceptable, provided the beacons are visible for up to 800 m under clear night-time conditions. If a temporary power line must cross over the road, the clearance above the road surface shall be at least 7.0 m.

3.6 Traffic Control Signals

Traffic Control Signals may be used for work on two lane roads for which traffic is reduced to one lane. The area controlled by signals shall not include any intersections or driveways to avoid possible conflicts.

Traffic control signals may be either semi-permanently mounted or mounted on portable trailers. Communication between the traffic control units may either be by hard wiring or radio communication. The traffic control signals shall have two heads in each direction and be oriented to provide maximum visibility to the approaching road users. The signals must be designed in accordance with "The Manual of Uniform Traffic Control Devices for Canada."

The use of Traffic Control Signals requires approval from the Department of Transportation's Maintenance and Traffic Branch.

3.7 Delineation Devices

Delineation Devices are used to clearly highlight the traffic's path through any Work Area where Diversions or tapers are required. They also delineate a separation between traffic and the Activity Area. Delineation Devices shall be spaced sufficiently close such that the appropriate path is clearly recognized by road users at all times. The maximum centre to centre delineator spacing for tangents and tapers is shown in Table 3-3 for varying speed limits.

Table 3-3: Maximum Spacing for Delineation Devices

Normal Posted Speed Limit (km/h)	Maximum Spacing Tangents (m)	Maximum Spacing Tapers (m)
50	8	6
60 - 70	10	8
80 - 90	14	10
100 - 110	24	18

Note: Flexible drums are the preferred device for tapers. However, delineator posts may be used provided spacing is half the distance in Table 3-2.

There are four types of acceptable Delineation Devices: delineator posts, traffic cones, flexible drums, and construction markers. These devices must all be orange in colour and, with the exception of construction markers, shall display one or more bands of white retroreflective striping as shown in Figure 3-2 that meet, as a minimum, ASTM D4956 Type III. Delineation Devices must also have sufficient ballast so they are not easily displaced by wind or passing vehicles.

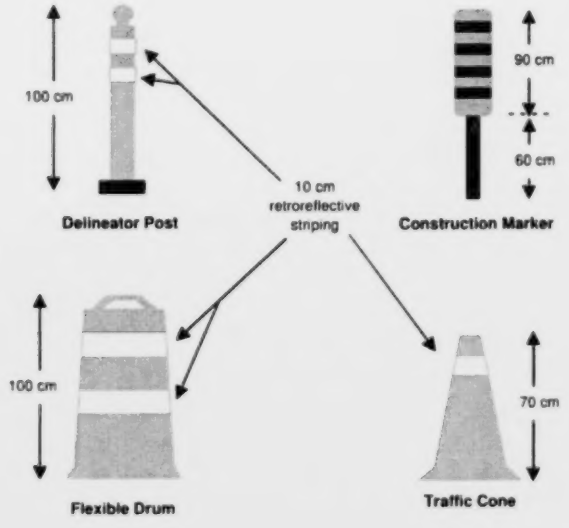


Figure 3-2: Delineation Devices

Delineator Posts (commonly referred to as traffic candles) are lightweight Delineation Devices that offer the least amount of impedance to road users. They shall be constructed of a low density polyethylene, have a minimum height of 100 cm, and display two 10 cm retroreflective white stripes. Delineator posts are commonly placed along the tangent sections of the road adjacent to the Buffer and Activity Areas. They are not recommended for providing delineation along tapers, due to the low visual target they offer. However, delineator posts may be used in tapers provided they are spaced at half the distance shown in Table 3-2.

Traffic Cones are lightweight Delineation Devices that may be easily stacked for storage. They shall be constructed of polyvinyl chloride (PVC), have a minimum height of 70 cm, and display one 10 cm retroreflective white stripe.

Flexible Drums offer a larger visible warning than delineator posts and traffic cones. They shall be constructed of low density polyethelyene, have a minimum height of 100 cm, and display two 10 cm retroreflective white stripes. Flexible drums are the preferred device for delineating tapers, and are also used on tangent sections adjacent to the Buffer and Activity Areas.

Construction Markers are signs consisting of nine alternating black and orange retroreflective stripes, each having a thickness of 10 cm. The base of a construction marker shall be mounted at least 60 cm above the road surface. Construction markers are typically used to delineate a hazard immediately adjacent to the travelled lanes, such as a continuous Barrier or a low shoulder. They shall not be used to provide centreline delineation in high speed or high volume Work Areas.

3.8 Temporary Pavement Markings

Temporary Pavement Markings are used in Work Areas, in combination with appropriate warning signs and Delineation Devices, to highlight the intended path that traffic is to follow.

Temporary pavement markings shall be used in Work Areas where:

- A paved Diversion is constructed to bypass work activities; or
- Partial pavement removal (i.e. milling, grinding) or overlays has caused the original markings to be removed or covered.

For paved Diversions, all temporary markings must be in place before the Diversion is opened to traffic. During pavement removal and overlay operations, temporary markings shall be placed at the end of each work day, prior to night time conditions.

Wherever temporary markings are applied, any conflicting markings must be removed or covered as soon as possible, to avoid driver confusion. If the original markings will be restored within two weeks, they may be covered using black paint; otherwise the markings must be milled out.

There are three types of acceptable devices for temporary pavement marking: pavement marking tape, raised pavement markers, and pavement marking paint with glass beads. When applied, all three should be the same color as the original markings which they replace. In addition, these devices shall meet the following minimum retroreflectivity requirements: 250 millicandelas for white markings and 200 millicandelas for yellow markings.

Pavement Marking Tape shall be applied in 2 m strips spaced at 50 m on tangent sections of road and 25 m on horizontal and vertical curves.

Raised Pavement Markers shall only be used on milled surfaces. They shall be installed in groupings of three within a 2 m length and spaced at 50 m on tangent sections of road and 25 m on horizontal and vertical curves. Nails are not to be used to install raised pavement markers.

Pavement Marking Paint shall be applied in 2 m strips spaced at 50 m on tangent sections of road and 25 m on horizontal and vertical curves. Glass beads shall be applied over the paint's full width and length. Paint shall not be used as a temporary marking on the final lift of asphalt.

3.9 Barricades

Barricades provide complete closure of a road, street, or lane for an extended period of time. Their assemblies can vary in size and complexity, depending on the location of the closure. There are two types of Barricades: directional and non-directional.

Directional Barricades are used to divert traffic around a closure, or direct it onto a Detour. They shall consist of at least two Barricade boards as shown in Figure 3-3, with alternating orange and black stripes in a chevron pattern. All stripes shall be 24 cm wide. Orange stripes shall be retroreflective and meet ASTM D4956 Type III / Type IV. The appropriate direction shall be used depending on whether traffic is being moved to the right or left.

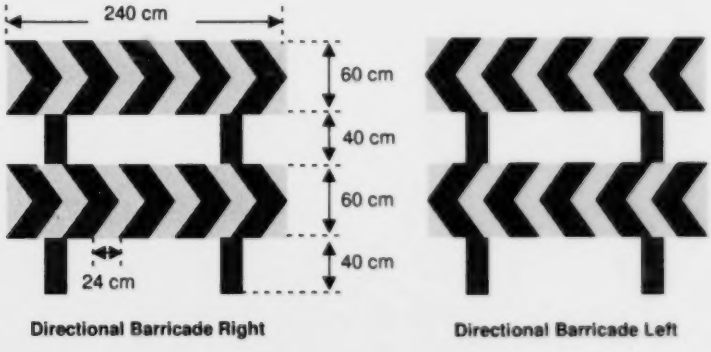


Figure 3-3: Directional Barricades

Non-directional Barricades are used for closures where traffic is neither directed to the right or left. They shall consist of at least two Barricade boards, as shown in Figure 3-4, with alternating orange and black vertical stripes. All stripes shall be 22 cm wide. Orange stripes shall be retroreflective and meet ASTM D4956 Type III / Type IV.

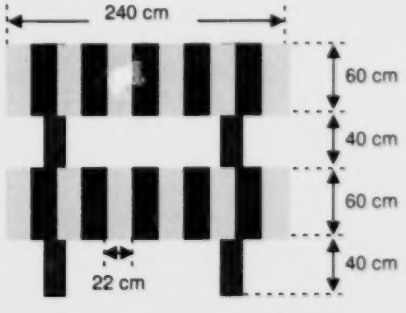


Figure 3-4: Non-Directional Barricade

Barricades shall be positioned at approximately 90 degrees to approaching traffic, to offer the largest target area. If Barricades are to remain in place during overnight hours, they must also be equipped with a minimum of two flashing red or amber beacons (as per Section 3.5). Beacons are not required for Low Volume Roads.

If a Work Area is to remain passive for an extended period (e.g over the winter months), non-directional Barricades shall be installed on all approaches to drop-offs, embankments, river crossings, and other areas that pose a safety risk. They shall be placed the entire width of the road such that no gap exists that is greater than 2 m. Barricades shall also be accompanied by a Road Closed sign, which is to be installed in the center of the roadway. This sign may be mounted directly on the Barricade provided an odd number is used; otherwise it shall be individually post mounted.

3.10 Barriers

Barriers are used to prevent vehicles from entering into the Activity Area, thus providing extra protection for both workers and road users. However, because Barrier installation involves a high degree of worker exposure, their use is typically reserved for Long Duration projects that are expected to take longer than three days to complete. The exception is on bridge structures, where workers do not have an escape route, and Barriers are required for work that is expected to take longer than one day to complete. Specific guidance on the use of Barriers is provided in the typical layouts.

Barriers shall be properly installed otherwise they may pose a hazard instead of offering protection. Proper installation practices include:

- Securely fastening individual Barrier devices together to form a continuous structure that acts as a single unit when impacted;
- Ensuring that the Barrier is installed at a 4:1 taper where indicated in the typical layout figures;
- Ensuring that the Barrier does not encroach into the Buffer Area or Transition Area.
- Maintaining at least a 0.5 m offset between the Barrier and the adjacent travelled lane, where possible; and,
- Supplementing Barriers with appropriate retroreflective markings such as construction markers or other devices meeting, as a minimum, ASTM Type III.

There are many different types of Barrier devices available. The only Barrier device pre-approved for use on provincial roads is the F-shape concrete Barrier meeting the NCHRP 350 TL-3 standard. Other Barriers may be approved by the Department of Transportation's Maintenance and Traffic Branch, provided the devices offer an equivalent level of protection.

3.11 Buffer Vehicles

Buffer Vehicles are stationed in advance of the Activity Area to protect workers from Errant Vehicles approaching a Work Area. Buffer Vehicles are required for setting up and removing Traffic Control Devices on multilane roads, Moving Operations on multilane roads, and for Short Duration work on bridges.

In addition to a Flashing Arrow Board, a Buffer Vehicle shall be equipped with a Truck Mounted Attenuator (TMA) meeting the requirements of NCHRP 350 TL-3 for all roads. The mass of the Buffer Vehicle shall be as per the TMA manufacturer's requirements.

3.12 Pilot Vehicles

A *Pilot Vehicle* may be used on two lane roads to guide road users through a one lane section of a long or complex Work Area, one direction at a time. They may also be used as means of controlling vehicle speeds or preventing vehicles from re-entering a closed lane prematurely (i.e before the road surface has had sufficient time to cool or cure). The following procedures shall be followed wherever Pilot Vehicles are used:

1. Traffic Control Persons shall regulate traffic at each end on the one lane section.
2. The Pilot Vehicle shall move into position at the front of the queue about to be released by the Traffic Control Person.
3. When directed by the Traffic Control Person, the Pilot Vehicle shall guide traffic through the Work Area, travelling at a speed that does not permit gaps to form between vehicles.
4. At the opposite end of the Work Area, the Pilot Vehicle shall pull over at the earliest safe location, and allow the following vehicles to pass.
5. When the last following vehicle has passed, the Pilot Vehicle shall then repeat the same procedures to lead traffic in the opposite direction.

To minimize road user delay and driver frustration, two Pilot Vehicles should be used on higher volume roads where delays are significant. On lower volume roads, the same Pilot Vehicle may be used to guide traffic in both directions.

All Pilot Vehicles shall be equipped with a 360 degree amber light (as per Section 3.5) as well as the Follow Me sign.

4 Installation and Inspection of Traffic Control Devices

4.1 Sign Installation

Sign Supports

Signs in Work Areas shall either be mounted on fixed or portable sign supports.

Fixed supports can either be constructed of wood or metal, and shall be installed directly into the ground. Wooden posts shall be a maximum size of 10 cm x 10 cm. Metal posts shall be a maximum size 5 cm x 5 cm, and have 11 mm diameter holes drilled on 25 mm centers on all four sides. Signs are not to be mounted in orange steel drums.

Portable sign supports may be used in place of fixed supports provided they have sufficient ballast to prevent them from being easily blown over or displaced by wind or passing vehicles. Sand-filled bags are recommended for providing extra ballast. Materials that may pose a hazard to road users, such as concrete blocks, shall not be used to provide ballast.

Sign Spacing

Signs shall be spaced so approaching road users have sufficient time to recognize the message and take any necessary action(s). The spacing shown in Table 4-1 shall be used as a minimum.

Table 4-1: Minimum Sign Spacing in Work Areas

Normal Posted Speed Limit (km/h)	Minimum Spacing (m)
50	50
60 - 70	75
80 - 90	100
100 - 110	150

In situations where the minimum spacing offers poor visibility to road users, such as on a hill or a curve where sight distance may be restricted, sign spacing should be increased accordingly. Similarly, the distance can also be increased where the minimum spacing causes signs to conflict with driveways.

Sign Position and Height

All signs on fixed supports shall be installed within a distance of 1.5 m to 4.0 m from the edge of the travelled lane, and oriented approximately 90 degrees to approaching traffic. In instances where portable sign supports cannot be placed at a minimum 1.5 m (due to narrow shoulders), the sign may be moved closer to the edge of the travelled lane provided it does not pose a hazard to approaching traffic.

The mounting height varies depending on the sign size and the type of sign support. Figures 4-1 and 4-2 depict the proper sign position and mounting height for fixed and protable sign supports. Note: tabs shall not be installed on top of a sign or in front such that the sign is obscured. Signs should be mounted at a consistent height through the Work Area.

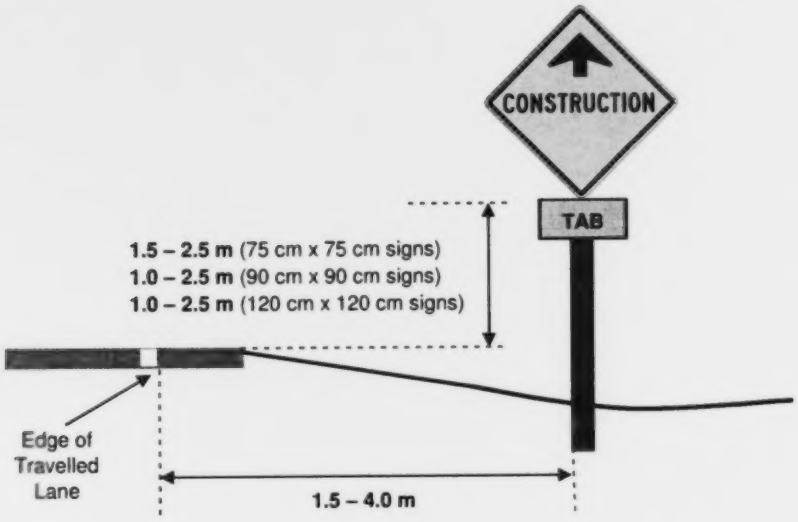


Figure 4-1: Sign Position and Height for Fixed Sign Supports

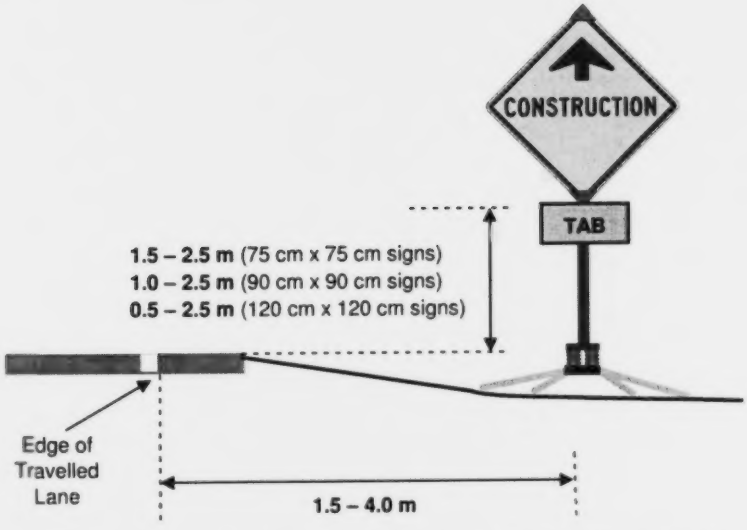


Figure 4-2: Sign Position and Height for Portable Sign Supports

Flags

In instances where 120 cm x 120 cm signs are mounted on portable sign supports at a height between 0.5 m and 1.0 m, any signs depicting "human activity" shall be accompanied by fluorescent orange flags. Human activity signs include: Road Work, Survey Crew, and Traffic Control Person. Other signs mounted at a height between 0.5 m and 1.0 m do not require flags.

Flags must consist of a bright orange cloth or plastic material, at least 30 cm x 30 cm in size, and be mounted such that they hang just above the sign.

Double Posting

Signs shall be double posted for all work carried out on all multilane divided roads. If the road is divided by a concrete median Barrier, and the minimum lateral distance cannot be achieved next to the inside lane, signs may be posted on top of the Barrier using a secure clamping device that is functional and will not pose a hazard to the motoring public. On roads with a posted speed limit of 100km/h or greater, the Traffic Control Agent may opt to use 90 cm x 90 cm signs next to the inside lane if they believe that 120 cm x 120 cm signs will pose a hazard to road users. Signs on multilane undivided roads shall be placed next to the right shoulder only.

If double faced signs (i.e. signs mounted on the reverse of other signs) are being used, care must be taken to ensure they are not visible from the opposing lane so as to not cause confusion.

4.2 Setup and Removal Procedures

Setting up and removing Traffic Control Devices can be more hazardous than completing the actual work, as workers are often directly exposed to traffic during these times. To minimize worker exposure, it is essential that setup and removal activities are carried out in a quick, yet orderly, manner. For this reason, it is also important to plan every setup and removal in advance.

While it is recognized that every Work Area presents its own unique circumstances that can impact how setup and removal are carried out, the following safety principles shall be adhered to:

- All workers shall wear the appropriate personal protective equipment as specified in Section 5;
- All vehicles involved in the setup and removal of Traffic Control Devices as a minimum must display 1) a 360 degree amber light on two lane roads; or 2) a Flashing Arrow Board on multilane roads;
- Work in the Activity Area shall only commence once all Traffic Control Devices are in place;
- No Delineation Devices, Barriers, or Barricades shall be installed until after all advance and approach signs have been setup; and
- A Dedicated Traffic Observer shall be present during all setup and removal activities to warn workers of potential hazards.

Some other best practices that can improve safety and should be followed whenever possible include:

- Offloading and loading Traffic Control Devices from the side of the truck farthest from traffic;
- Assembling and disassembling Traffic Control Devices away from the roadway;
- Avoiding pointing Work Vehicles towards the flow of traffic, especially at night.

Generally, signs are to be setup and removed beginning in the Advance Warning Area and then proceeding toward the Activity Area with the flow of traffic. Figures 4-3 to 4-10 (referenced below) illustrate the proper procedures and sequencing that shall be followed for common activities involved in the setup and removal of traffic control on two lane and multilane roads.

Two Lane Roads	
Activity	
Sign Setup →	**Figure 4-3**
Lane Closure Setup (where required) →	**Figure 4-4**
Lane Closure Removal (where required) →	**Figure 4-5**
Sign Removal →	**Figure 4-6**
Multilane Roads	
Activity	
Sign Setup →	**Figure 4-7**
Lane Closure Setup (where required) →	**Figure 4-8**
Lane Closure Removal (where required) →	**Figure 4-9**
Sign Removal →	**Figure 4-10**

Sequence

1. Begin at the first advance warning sign on the same side of the road as the Activity Area.
2. Proceed with the flow of traffic, placing all signs on the same side of the road as the Activity Area.
3. Make a legal turn.
4. Sign the opposite approach, beginning at the first advance warning sign and working with the flow of traffic.

Special Instructions

- Sign truck must display either 1) a Flashing Arrow Board set to the caution mode (recommended), or 2) a 360 degree amber light.
- Figure 7-2 shall be used for the installation of fixed sign supports,
- An additional Trail Vehicle may be used based upon site specific conditions such as restricted sight distances.

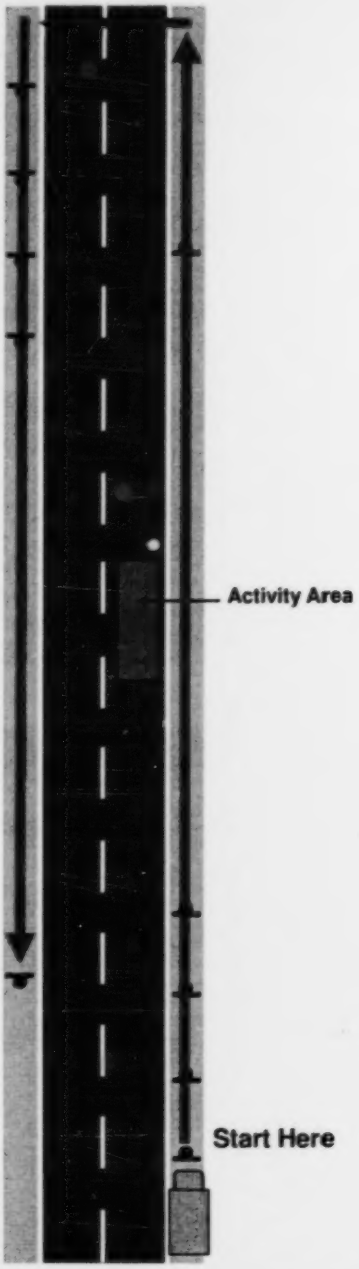


Figure 4-3: Sign Setup (Two Lane Roads)

Sequence

1. Ensure that all signs and Traffic Control Persons (TCPs) are in place.
2. Begin with the Transition Taper, laying out delineators with the flow of traffic.
3. Set up the FAB / Barricade inside the Transition Taper.
4. Continue with the flow of traffic, laying out delineators in the Buffer and Activity Areas.
5. Lay out delineators in the termination taper.
6. Set up the FAB / Barricade inside the termination taper.

Special Instructions

- Sign truck must display either 1) a FAB set to the caution mode (recommended), or 2) a 360 degree amber light.

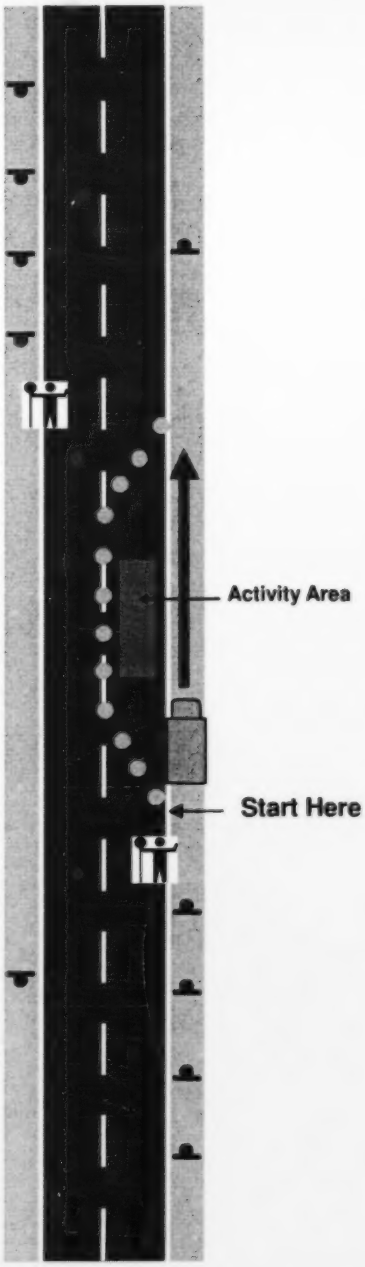


Figure 4-4: Lane Closure Setup (Two Lane Roads)

Sequence

1. Ensure that all work activities are complete and that workers, materials, and equipment have been removed from the Activity Area.
2. Have TCPs regulate flow in both directions, as needed.
3. Remove the FAB / Barricade inside the termination taper.
4. Pick up the delineators in the terminating taper (or at the furthest delineator if no termination taper exists).
5. Continue against the flow of traffic, picking up delineators in the Activity and Buffer Areas.
6. Have TCP #1 stop traffic in the closed lane.
7. Pick up delineators in the Transition Taper.
8. Remove the FAB / Barricade inside the Transition Taper

Special Instructions

- Sign truck must display either 1) a FAB set to the caution mode (recommended), or 2) a 360 degree amber light.

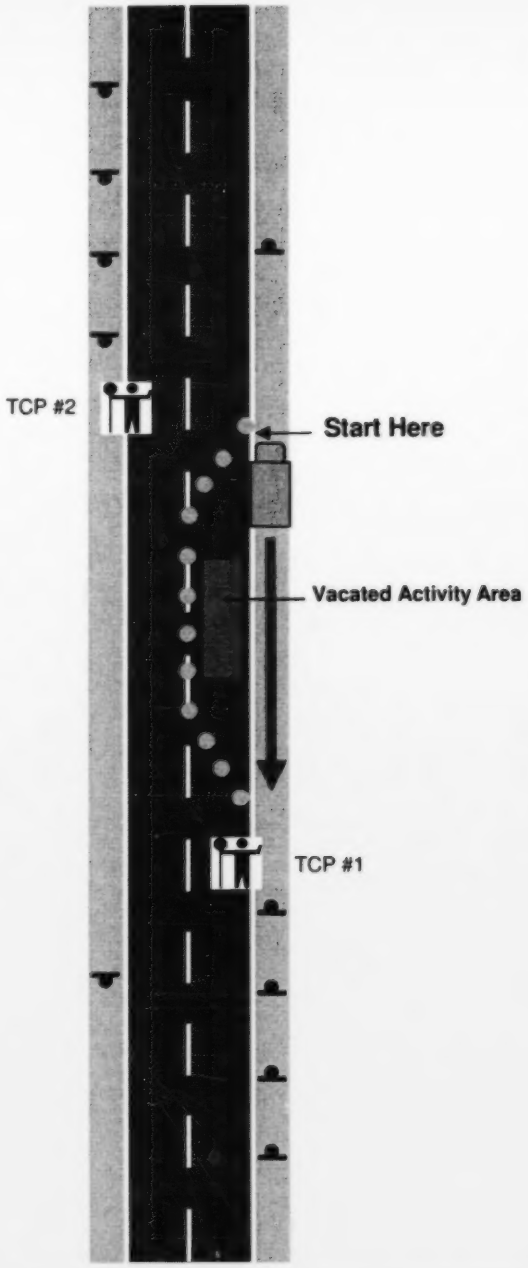


Figure 4-5: Lane Closure Removal (Two Lane Roads)

Sequence

1. Ensure that the Activity Area is clear of all workers, materials, equipment, and Delineation Devices.
2. Beginning on the same side of the road as the Activity Area, proceed with the flow of traffic, picking up all signs on the shoulder.
3. Make a legal turn.
4. Pick up signs on the opposite approach, beginning at the first advance warning sign and working with the flow of traffic.
5. Make a legal turn.
6. Pick up all remaining signs on the same side of the road as the Activity Area, beginning with the first advance warning sign and following the flow of traffic.

Special Instructions

- Sign truck must display either 1) a FAB set to the caution mode (recommended), or 2) a 360 degree amber light.
- An additional Trail Vehicle may be used based upon site specific conditions such as restricted sight distances or high volumes.

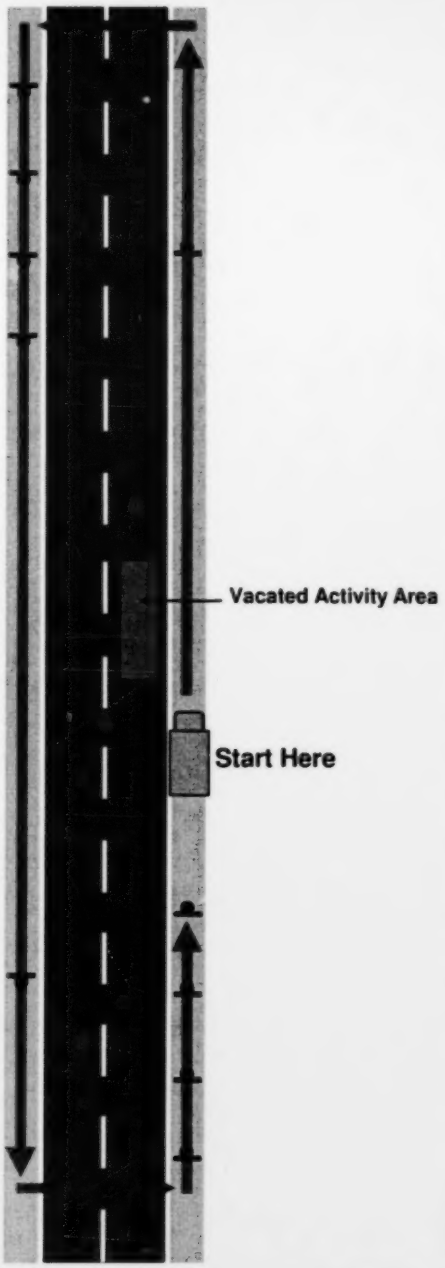


Figure 4-6: Sign Removal (Two Lane Roads)

Sequence

1. In general, begin sign placement at the first advance warning sign on the right side of the road. If setup involves a closure, begin sign placement at the first advance warning sign on the opposite side of the road from the Activity Area.
2. Proceed with the flow of traffic, placing all signs on the same side of the road which the setup began.
3. Make two legal turns (at interchanges or median crossovers) and return to the beginning of the Advance Warning Area.
4. Sign the shoulder on the opposite side of the road, beginning at the first advance warning sign and working with the flow of traffic.

Special Instructions

- Sign truck shall display a FAB set to the appropriate directional arrow.
- Buffer Vehicle shall be equipped with a FAB displaying the appropriate directional arrow and remain a distance B behind the Sign Truck as per Table 2-3.
- Figure 8-3 shall be used for the installation of fixed sign supports,
- An additional Trail Vehicle may be used based upon site specific conditions such as restricted sight distances or high volumes.
- In cases where vehicles do not encroach on the travelled lane, Buffer Vehicle may be substituted with a Trail Vehicle.

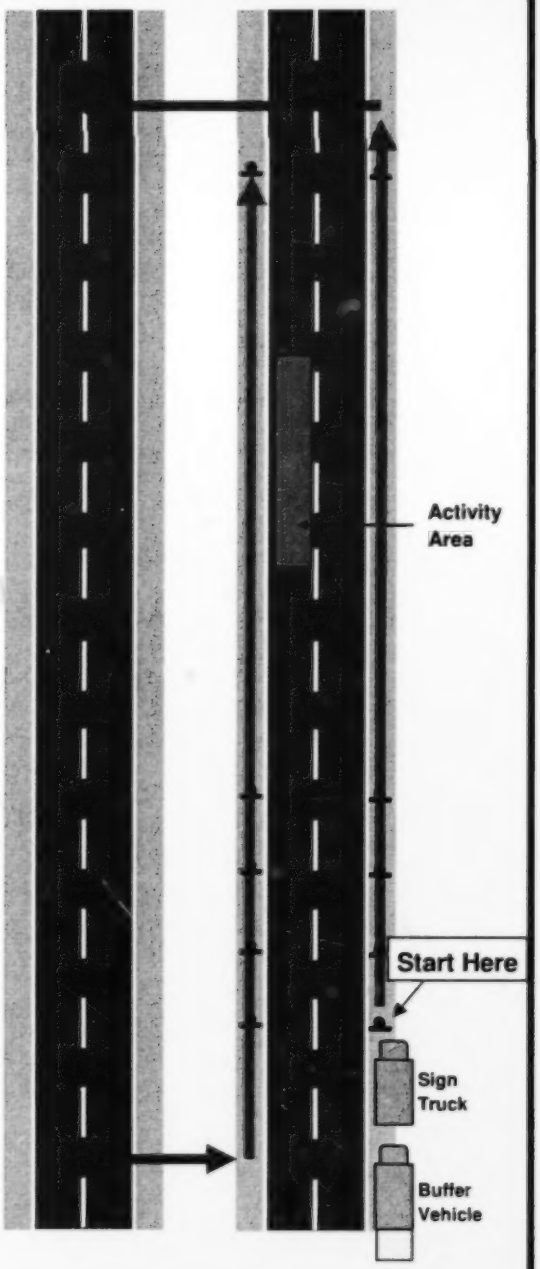


Figure 4-7: Sign Setup (Multilane Divided Roads)

Sequence

1. Ensure that all signs are in place.
2. Station the Buffer Vehicle in the lane to be closed immediately in advance of the start of the Transition Taper, with a FAB indicating the appropriate direction.
3. Lay out delineators in the Transition Taper, beginning at the shoulder and working towards the centreline.
4. Set up the FAB inside the Transition Taper.
5. Continue with the flow of traffic, laying out delineators in the Buffer and Activity Areas.
6. Lay out delineators in the terminating taper (if necessary).

Special Instructions

- Sign truck shall display a FAB set to caution mode.
- Buffer Vehicle shall be equipped with a FAB displaying the appropriate directional arrow and remain a distance B behind the Transition Taper as per Table 2-3.

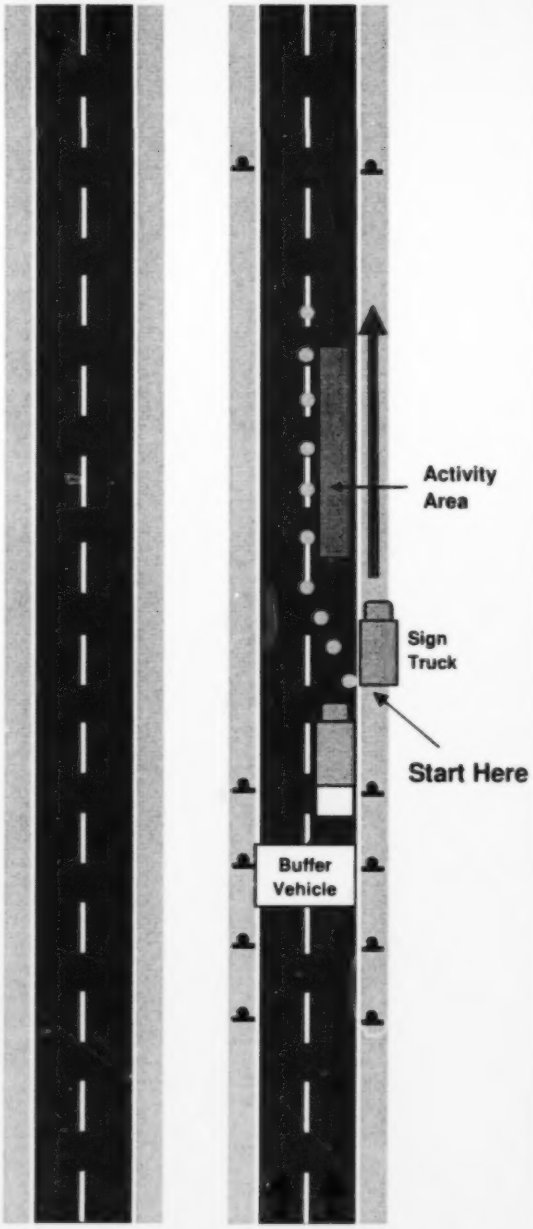


Figure 4-8: Lane Closure Setup (Multilane Divided Roads)

Sequence

1. Ensure that all work activities are complete and that workers have vacated the Activity Area.
2. Station the Buffer Vehicle in the closed lane immediately in advance of the Transition Taper, with a FAB indicating the appropriate direction.
3. Pick up the delineators in the terminating taper (or at the furthest delineator if no termination taper exists).
4. Continue backing against the flow of traffic, picking up delineators in the Activity and Buffer Areas.
5. Remove the arrow board inside the Transition Taper.
6. Pick up delineators in the Transition Taper.

Special Instructions

- Sign truck shall display a FAB set to caution mode.
- Buffer Vehicle shall be equipped with a FAB, displaying the appropriate directional arrow and remain a distance B behind the Transition Taper as per Table 2-3.

Lane Closure Switch

The follow steps shall be followed when switching a lane closure:

1. Ensure that the Activity Area has been vacated.
2. Station the Buffer Vehicle in the closed lane, immediately in advance of the Transition Taper.
3. Remove the FAB inside the Transition Taper.
4. Move delineators in the Transition Taper to the centreline.
5. Replace the Lane Closed Ahead signs to depict the appropriate direction.
6. Reposition the Buffer Vehicle in lane to be closed, immediately in advance of the Transition Taper.
7. Set up the FAB inside the Transition Taper.
8. Reconstruct Transition Taper.

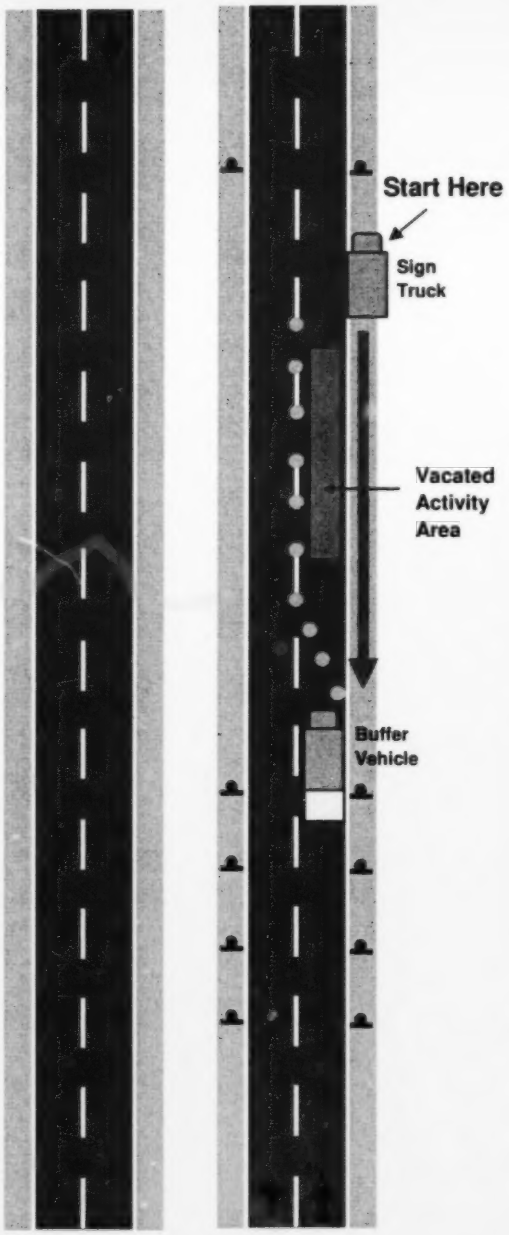


Figure 4-9: Lane Closure Removal (Multilane Divided Roads)

Sequence

1. Ensure that the Activity Area is clear of all workers, equipment, and Delineation Devices.
2. In general, begin sign removal at the first advance warning sign on the left side of the road. If setup involves a closure, begin sign removal at the first advance warning sign on the same side of the road as the Activity Area.
3. Proceed with the flow of traffic, removing all signs on the same side of the road on which removal began.
4. Make two legal turns (at interchanges or median crossovers) and return to the beginning of the Advance Warning Area.
5. Remove signs from the other shoulder, beginning at the first advance warning sign and working with the flow of traffic.

Special Instructions

- Sign truck shall display a FAB set to the appropriate directional arrow.
- Buffer Vehicle shall be equipped with a FAB, displaying the appropriate directional arrow and remain a distance B behind the Sign Truck as per Table 2-3.
- An additional Trail Vehicle may be used based upon site specific conditions such as restricted sight distances or high volumes.
- In cases where vehicles do not encroach on the travelled lane, Buffer Vehicle may be substituted with a Trail Vehicle.

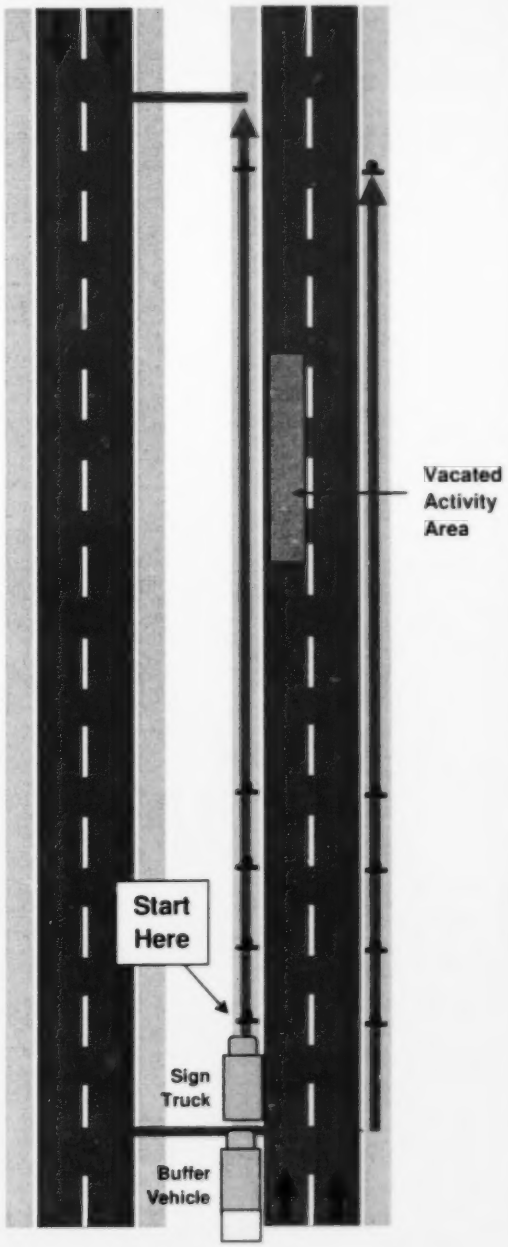


Figure 4-10: Sign Removal (Multilane Divided Roads)

4.3 Inspection and Documentation

For every project, the Traffic Control Agent shall perform an *Initial Inspection* immediately following the setup of all devices to ensure that the Traffic Control Plan has been properly implemented. This initial inspection shall document the following information:

- The date and time of the inspection;
- Verification that all Traffic Control Devices are in their proper location, in good condition, and functioning as intended;
- A description of any changes made to the original Traffic Control Plan, including the reasons for these changes;
- Any observed driver issues (confusion, excessive speeds, etc.); and
- The signature of the Traffic Control Agent.

No work activities shall commence until after the initial inspection has been completed and documented. An initial night inspection shall also be undertaken if traffic control is to be left in place during hours of darkness.

Routine inspections of Work Areas are also necessary to ensure that all Traffic Control Devices remain in their proper location and continue to function as intended. The frequency of these inspections depend on the project size and duration, the complexity of traffic control, the nature of the work, and the number of problems observed in previous inspections. For Long Duration projects, inspections shall be conducted at the beginning and end of each work day as a minimum. Daily inspections shall also be conducted on holidays, weekends, and other times when the Work Area is not Active. Traffic control that is left in place overnight should also be inspected during hours of darkness. Work Areas that remain Passive for an extended period (e.g. over the winter months) shall be inspected at least every two weeks.

Any issues noted during routine inspections, such as damaged or displaced signs, shall be corrected immediately. Furthermore, it is imperative that any changes to the Traffic Control Plan are reported to and documented by the Traffic Control Agent. The Traffic Control Agent shall maintain a file at all times that includes the original Traffic Control Plan, as well as all documentation from the initial and routine inspections. This file shall be maintained as part of the official contract documents upon completion of the work. Maintaining adequate documentation of traffic control is necessary in the event of litigation arising from an accident in the work zone.

If an accident does occur, appropriate assistance should be rendered to any injured persons. The Traffic Control Agent shall then ensure that the following information has been compiled:

- The location of all devices at the time of the accident (with photos if possible);
- A sketch of the accident location identifying vehicles, equipment, and Work Area personnel involved;
- Weather conditions at the time of the accident;
- A brief summary of what happened and the actions taken; and

- A list of witnesses (including license plate number and location at time of occurrence), the name of the attending police officer(s), the accident report file number, and whether emergency vehicles were required.

4.4 Quality Guidelines

The temporary nature of road work activities means that Traffic Control Devices are often subjected to damage and wear as a result of constantly being transported, installed, removed, and stored. Over time, this repeated wear can cause a device to lose its effectiveness. While it is not practical to require that new devices be used at all times, it is imperative that a minimum quality standard be maintained. Table 4-2 provides qualitative guidelines for assessing the condition of various types of Traffic Control Devices. All Traffic Control Devices used in work areas shall meet the acceptable criteria shown.

It is recognized that assessing device condition can be a rather subjective task, as devices can be worn or damaged in a variety of different ways. Figures 4-11 and 4-12 provide examples of acceptable and unacceptable device condition to assist in this task. Sound technical judgement shall be applied when deciding whether or not a device meets minimum acceptable standards.

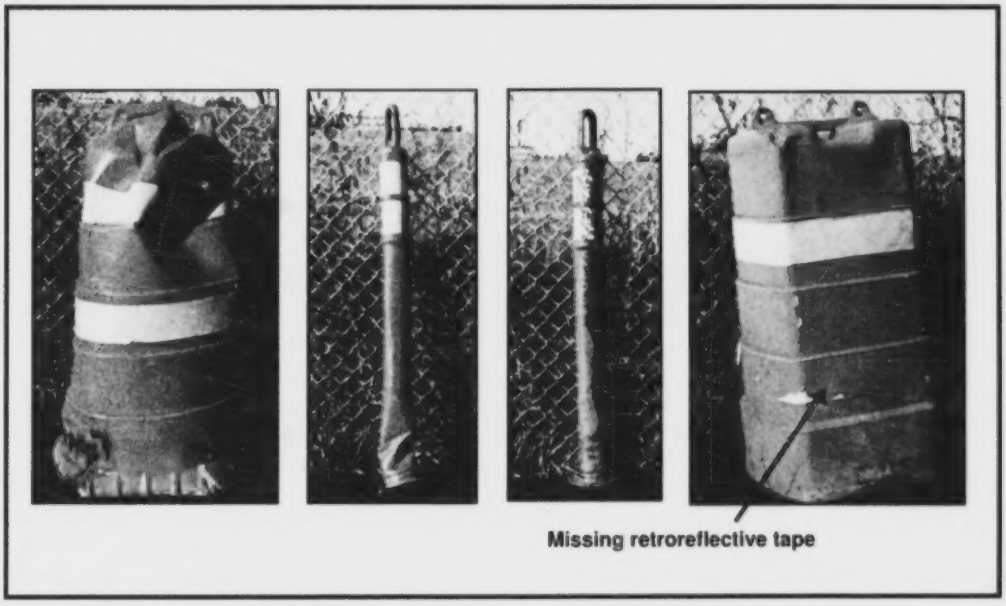


Figure 4-11: Examples of Unacceptable Drums and Delineator Posts

Acceptable

Unacceptable

Figure 4-12: Examples of Acceptable and Unacceptable Traffic Control Signs

Table 4-2: Quality Guidelines for Traffic Control Devices

Device Type	Acceptable	Unacceptable
Traffic Control Signs **(see Figure 4-11)**	• Small amount of asphalt splatter, dirt, dust, or snow that does not affect legibility • Several minor surface abrasions • Very little loss of lettering • No touchup of lettering • Message is legible both day and night • Minor discolouration	• Covered in asphalt splatter, dirt, dust, or snow • Several large surface abrasions or tears • Significant loss of lettering • Lettering has been touched up • Message is partly missing or illegible • Noticeable colour fading
Flexible Drums & Delineator Posts **(see Figure 4-12)**	• Small amount of asphalt splatter, dirt, dust, or snow that does not reduce reflectivity • Several small tears or scratches on sheeting • Original shape is maintained • Contain dents or fractures that do not affect stability • Minor discolouration	• Covered in asphalt splatter, dirt, dust, or snow • Substantial deformation from its original shape • Contains dents or fractures that affect stability • More than 20% of the reflective material is damaged or missing • Noticeable color fading
Flashing Arrow Boards	*Arrow Mode* • Not more than 1 lamp out in the bar, none out in the arrow head *Caution Mode* • 5 or more lamps operating	*Arrow Mode* • 2 or more lamps out in the bar, any out in the arrow head *Caution Mode* • Less than 5 bulbs operating
Variable Message Signs	• 90% or more of the pixels in each character are operating properly	• Less than 90% of the pixels in each character are not operating properly
Temporary Pavement Markings	• No more than 10% of all tape, paint, or markers are missing.	• More than 10% of tape, paint, or markers are missing

5 Work Area Personnel

Work Area personnel have varying responsibilities depending on the specific role and duties to which they are assigned. Sections 5.1 to 5.5 describe the various responsibilities and associated training requirements for the following types of Work Area personnel:

- Traffic Control Agents;
- Traffic Control Persons;
- Dedicated Traffic Observers;
- Device Installers; and
- Other Workers.

All Work Area personnel must receive appropriate training to match the job decisions they will be required to make prior to commencing their respective work activities.

Personal Protective Equipment

All Work Area personnel, regardless of their specific role, must wear personal protective equipment at all times, to maintain a high degree of visibility and protection. Personal protective equipment shall comply at a minimum with the provisions of the Occupational Health and Safety Act, Regulation 91-191. Work Area Personnel are also expected to comply with the policies and procedures for the use of personal protective equipment established by their employer.

5.1 Traffic Control Agents

Responsibilities

Each Work Area shall have a *Traffic Control Agent* who is responsible for properly implementing and maintaining the Traffic Control Plan. Specific duties of the Traffic Control Agent include:

- Ensuring that the minimum standards prescribed by this manual have been implemented;
- Exercising sound technical judgement in ensuring that the Traffic Control Plan suits local conditions;
- Ensuring that additional Traffic Control Devices and worker protection are used when necessary;
- Performing routine inspections and documentation of all devices in the Work Area; and
- Ensuring that any Traffic Control Devices that are damaged or in poor condition are immediately replaced;

Training

All Traffic Control Agents must successfully complete a WATCM training course as approved by the Department of Transportation's Maintenance and Traffic Branch, with recertification required every three years.

5.2 Traffic Control Persons

Responsibilities

Traffic Control Persons (TCPs) are used in Work Areas to regulate traffic and prevent conflicts between vehicles and Work Area activities. The duties of a TCP are to:

- Direct traffic safely through the Work Area;
- Stop traffic whenever the progress of work requires, in order to provide a safe Work Area and ensure the safety of the workers; and
- Warn workers of impeding danger.

Given the significant importance of these responsibilities, only individuals who have received proper training shall be used as TCPs.

Training

Traffic Control Persons shall complete training as per Occupational Health and Safety Act Regulation 91-191 and the policies and procedures established by their employers.

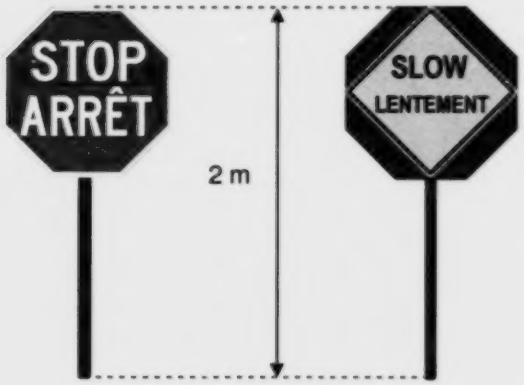
Required Signage

A Traffic Control Person Ahead sign shall always be erected in advance of the TCP to inform road users of their presence and prepare them to obey given direction. This sign shall be in place before the TCP commences signalling, at the appropriate distance as indicated in Table 5-1. When the TCP is not directing traffic, this sign shall be removed, covered, or turned away from traffic.

Table 5-1: Placement Distances for Traffic Control Person Ahead

Normal Posted Speed Limit (km/h)	Distance (m)
50	100 - 150
60 - 70	150 - 225
80 - 90	200 - 300
100 - 110	300 - 450

A *Stop/Slow Paddle* shall be used by the TCP to direct traffic. Both the stop sign and the slow sign are to be 50 cm X 50 cm, and mounted on the top of a pole such that the top of the signs is a minimum of 2 m above the roadway. Both signs shall also be retro-reflective with high intensity sheeting. At no time should the TCP use red flags to control traffic.



Position & Location

A TCP shall stand just outside the travelled lane at a location approximately 40-50 m in advance of the Activity Area or Transition Taper. In situations where the posted speed is 60 km/h or less, this distance may be reduced to 20-30 m. For patching, milling, and paving, these distances shall be relative to the Work Vehicles (i.e. asphalt truck, etc.). For all situations, the TCP must be able to see (and be seen by) approaching traffic for at least 150 m.

Once a TCP has been assigned a position, they must immediately plan an escape route (i.e. a place to move to avoid Errant Vehicles that may disregard their signals). In the event this does occur, the TCP must move out of the path of the vehicle and then immediately warn the workers.

While signalling, a TCP must:

- Be alert at all times, and aware of work activities and oncoming traffic;
- Face on-coming traffic, and never turn their back on moving traffic;
- Refrain from using cell phones or other entertainment devices;
- Stand alone, and not mingle with workers or the public; and
- Not perform any other work.

If conversations with road users are unavoidable, the TCP must remain in position and keep conversation brief.

Signalling Procedures

Proper signalling methods and procedures are taught in the certified signaller's course. These procedures shall be followed at all times to ensure that traffic is directed in a safe and consistent manner. Common procedures are described in Table 5-2.

Table 5-2: Common Signalling Procedures

To stop traffic: 1. Stand just outside the travelled lane 2. Place the paddle on the edge of the lane with th e stop sign facing oncoming traffic 3. Use hand signals to indicate to the road user wh ere to stop 4. Give full attention to the approaching vehicle unti l it has come to a complete stop
To move traffic from a stopped position: 1. Verify that opposing traffic has stopped and that t he last opposing vehicle has passed 2. Check the construction activity to ensure that the lane will be clear 3. Reverse the paddle to display slow 4. Use hand signals to direct traffic to the appropria te path
To allow traffic to proceed at a reduced speed: 1. Stand just outside the travelled lane 2. Place the paddle on the edge of the lane with th e slow sign facing oncoming traffic 3. Use hand signals to direct traffic to the appropria te path or to reduce speed, as needed

Communication

Clear and effective communication amongst TCPs is vital to ensuring that traffic control is carried out in the safest possible manner.

When TCPs are in sight of each other, they should use pre-arranged visual signals to communicate. Effective signals include raising and lowering or waving the paddle before changing from slow to stop, and vice-versa. Before changing traffic flow, signals must be acknowledged by the other TCP.

When TCPs are not in sight of each other, a third TCP should be placed at an intermediate location to relay signals. The intermediate TCP must also be equipped with a stop/slow paddle.

Two-way radios should be used when TCPs are not in sight of each other. When using two-way radios, the following precautions should be taken:

- Test radios in advance and carry spare batteries;
- Establish clear voice signals for each situation and stick to them;
- Speak crisply and distinctly;
- Repeat any messages that are not understood; and
- Avoid unnecessary talk.

5.3 Dedicated Traffic Observers

Responsibilities

Dedicated Traffic Observers are used to monitor oncoming traffic and warn workers of potential hazards or threats during the setup and removal of Traffic Control Devices and for other activities that require a worker to be on or near the travelled lane for only a very brief period. To do so, they must be located in a position with a clear view of traffic. The means by which the traffic observer will warn the workers shall be determined before the activity begins. Dedicated Traffic Observers shall not be engaged in other activity while monitoring traffic.

Training

All Dedicated Traffic Observers must attend a WATCM awareness session as approved by the Department of Transportation's Maintenance and Traffic Branch.

5.4 Device Installers

Responsibilities

Sign Installers include any person(s) directly involved with the setup and removal of Traffic Control Devices in a Work Area.

Training

All device installers must attend a WATCM awareness session as approved by the Department of Transportation's Maintenance and Traffic Branch

5.5 Other Workers

Responsibilities

Other Workers include any other person(s) on site while the work is being carried out. This includes equipment operators, general labourers, inspectors, etc.

Training

All workers must attend a WATCM awareness session as approved by the Department of Transportation's Maintenance and Traffic Branch.

6 Selecting the Appropriate Traffic Control Layout

Sections 7 and 8 contain typical traffic control layouts for common work activities. When selecting the most appropriate layout for a particular activity, the following four factors must be considered:

- Work Location
- Work Duration
- Traffic Volumes
- Vehicle Speeds

Each of these factors is described in the following sections.

6.1 Work Location

The location of an Activity Area within the right-of-way is a major factor when selecting the appropriate traffic control layout. The more an Activity Area encroaches onto the road and interferes with the flow of traffic, the greater the level of traffic control required. There are four categories of work location:

Roadside ...	Work that is carried out within the road right-of-way, but outside the shoulder area.
Shoulder ...	Work that is carried out on the shoulder area of the road, but which does not encroach on the travelled lanes.
Partial Lane Closure...	Work that is carried out in a travelled lane without reducing the remaining useable lane width below 2.5 m. (Note: Partial Lane Closures shall not be used on multilane roads).
Lane Closure...	Work that is carried out on the travelled way and reduces the remaining useable width of one or more lanes to less than 2.5 m.

6.2 Work Duration

Work duration is the length of time that an Activity Area occupies a single location or several adjacent locations that are sufficiently close to be effectively considered as one. There are four categories of work duration:

Moving Operations... Work that is either done *continuously*, usually at slow speeds, or *intermittently*, with brief stops related to the work. Examples of Moving Operations include: line painting, mowing, sweeping, and pavement testing.

Very Short Duration... Work that occupies a fixed location for up to 30 minutes, including the time required to setup and remove Traffic Control Devices.

Short Duration... Work that occupies a fixed location for longer than 30 minutes, yet less than 1 day.

Long Duration... Work that occupies a fixed location for longer than 1 day.

As work duration increases, so too does the exposure for workers. As a result, the magnitude of traffic control is typically greater for longer duration Work Areas.

6.3 Traffic Volumes

The level of traffic control required may also depend on the traffic volumes through the Work Area. Low Volume Roads typically require a less complex traffic control layout since worker exposure to traffic is reduced.

For the purposes of selecting the appropriate traffic control layout, a Low Volume Road is any road with an AADT of less than 300 vehicles per day.

6.4 Vehicle Speeds

The faster a vehicle is travelling, the more distance the driver will require to recognize, interpret, and react to any traffic control devices or personnel which they may encounter in a Work Area. For this reason, as the posted speed changes in the Work Area, so does the:

- Size of Traffic Control Devices;
- Distance for providing advance warning;
- Spacing between devices in the Approach Area; and the
- Lengths of tapers and Buffer Areas.

Each layout contained in Chapters 7 and 8 includes a table that specifies the minimum dimensions for each of these items.

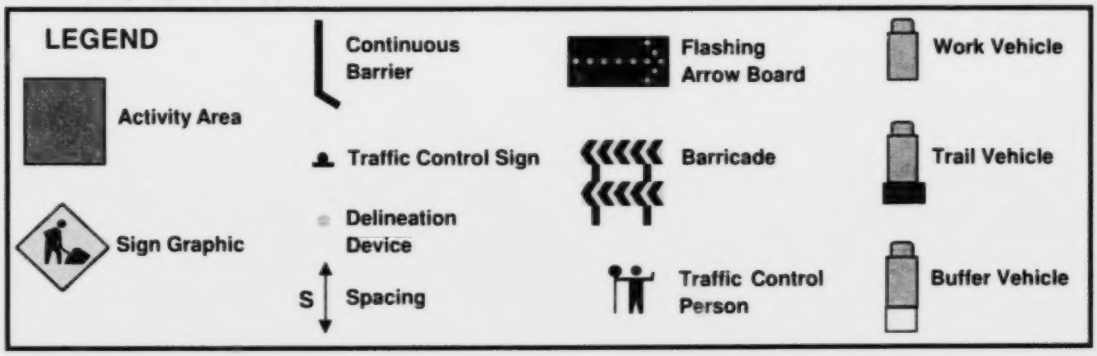
7 Typical Layouts for Two Lane Roads

GENERAL LAYOUTS

Activity	Work Location	Duration	Volume	Figure No.
Any	Roadside	Any	All	7-1
	Shoulder	Very Short	All	7-2
		Short	All	7-3
		Long	All	7-4
	Single Lane (inc. Bridges)	Short	All	7-5
		Long	AADT < 300 vpd	7-6
			AADT > 300 vpd	7-7
Shoulder Diversion	Single Lane	Short / Long	All	7-8a&b
Single Lane Diversion	Two Lanes	Long	AADT < 300 vpd	7-9
			AADT > 300 vpd	7-10
Two Lane Diversion (surfaced)	Two Lanes	Long	All	7-11
Two Lane Diversion (unsurfaced)	Two Lanes	Long	All	7-12
Detour	Two Lanes	Any	All	7-13
Climbing Lane	Uphill Right Lane	Short / Long	All	7-14
	Uphill Centre Lane	Short / Long	All	7-15
	Downhill Lane	Short / Long	All	7-16
Auxiliary Lane	Deceleration Lane	Short / Long	All	7-17
	Acceleration Lane	Short / Long	All	7-18

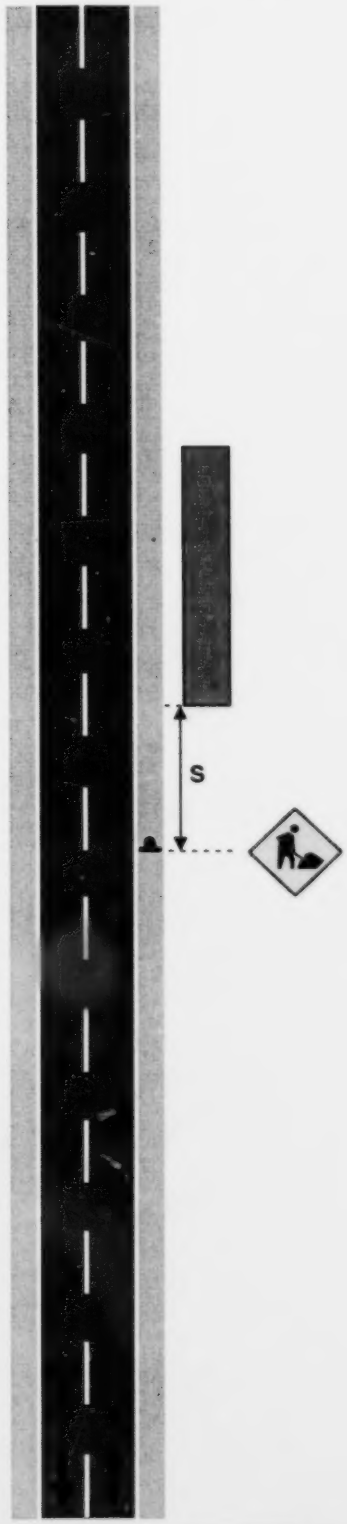
SPECIAL LAYOUTS

Activity	Work Location	Duration	Volume	Figure No.
Surveying	Shoulder	Short	All	7-19
	Single Lane	Short	All	7-20
Patching	Single Lane	Short / Long	All	7-21
Milling & Paving	Single Lane	Short / Long	All	7-22
After Milling or Paving				7-23
Chipsealing	Single Lane	Short / Long	All	7-24
Grading	Single Lane	Short	All	7-25
Line Painting	Single Lane	Moving	All	7-26
Blasting Area				7-27
Low Shoulder				7-28
Other Hazards				7-29
Temporary Haul Road				7-30
Advance Signing (Major Project)				7-31



NOTES:

1. No signs are required for work that occurs outside 15 m from the edge of the travelled lane.
2. No signs are required for mowing operations. However, the mower shall be equipped with a 360 degree amber light and a Slow Moving Vehicle Triangle.
3. For mowing operations, the first swath adjacent to the road must be mowed following the direction of traffic.
4. Shoulder must remain clear of all workers, vehicles, and equipment while work is in progress.



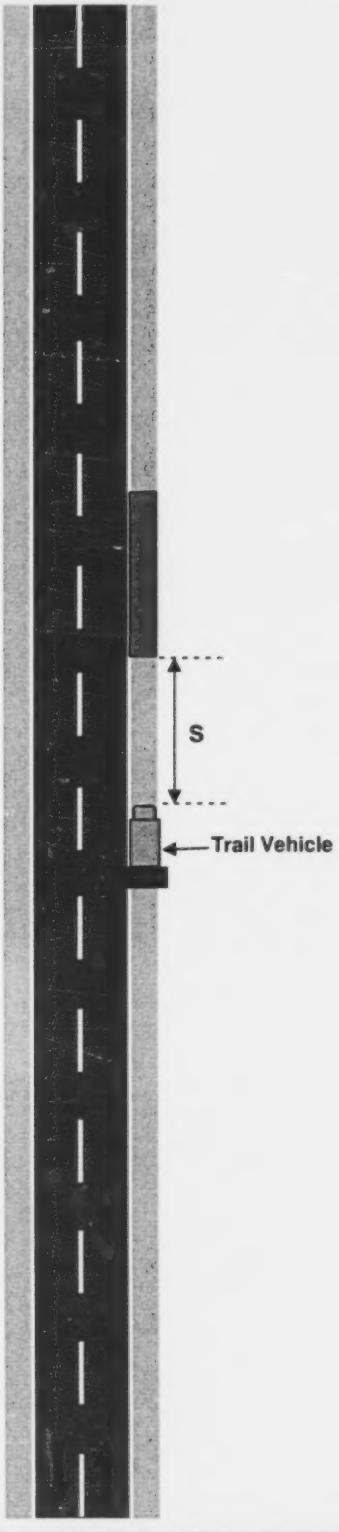
Roadside Work Any Duration All Volumes				
V	50	60-70	80-90	100
S	50	75	100	150

V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

NOTES:

1. Trail Vehicle shall be equipped with a Flashing Arrow Board set to caution mode or a 360 degree amber light.
2. No workers, equipment, or vehicles shall encroach on the travelled lane.



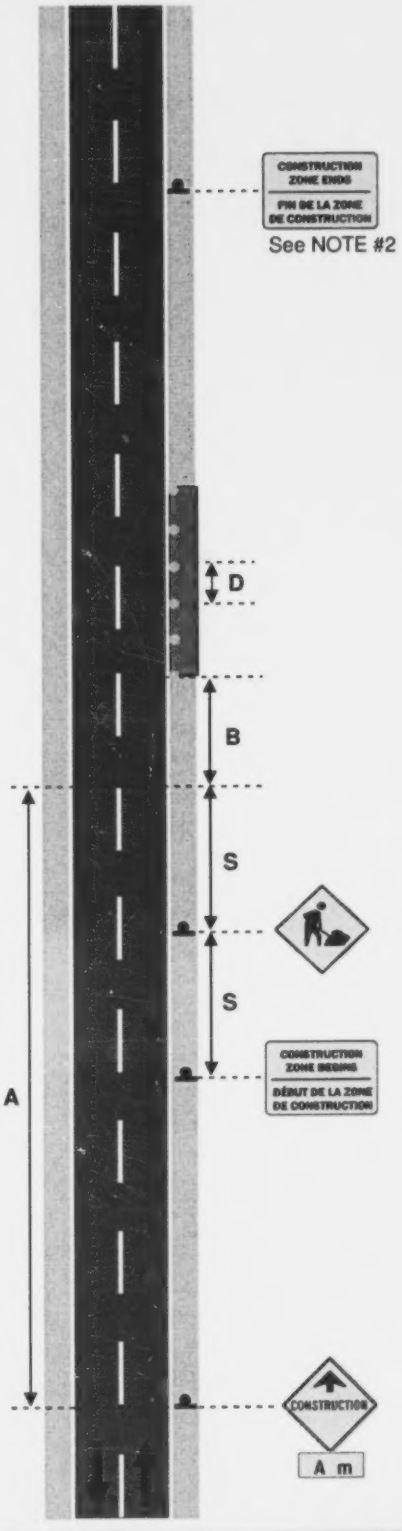
Shoulder Work Very Short Duration (less than 30 min) All Volumes				
V	50	60-70	80-90	100
S	50	75	100	150

V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.



Shoulder Work Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	350	500	1000
S	50	75	100	150
D	8	10	14	24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

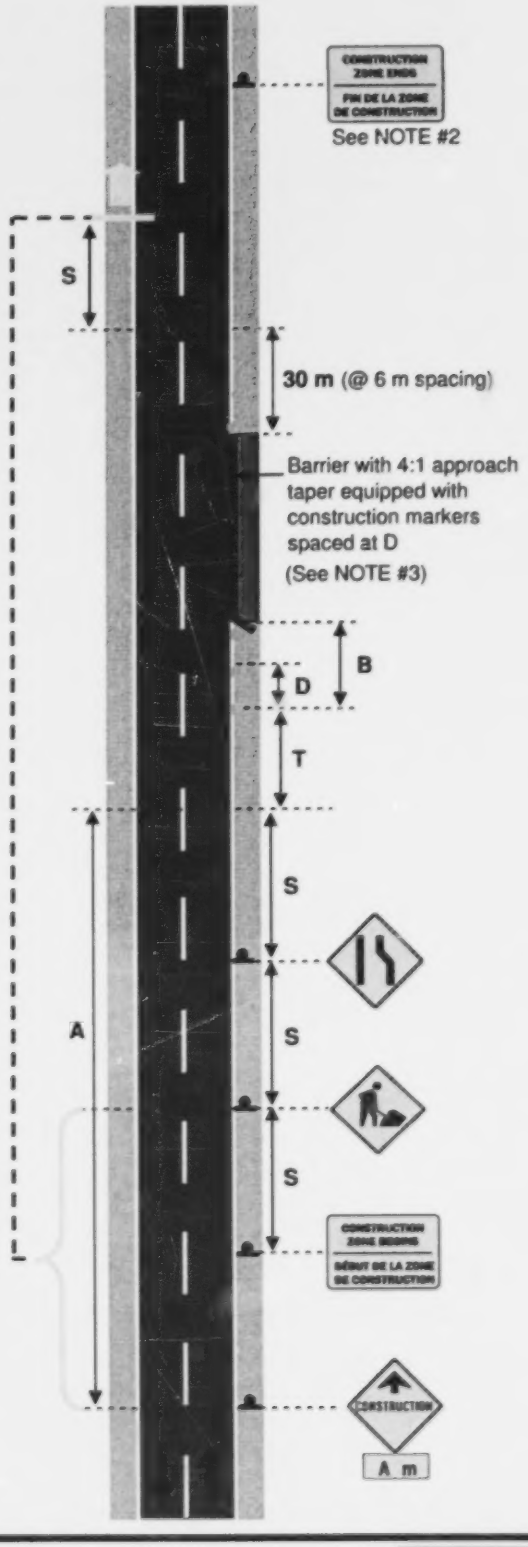
S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing (m)

B – Buffer Area Length (m)

NOTES:

1. Sign opposite approach in the same manner, without the Road Narrows sign.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
4. Figure 7-6 or 7-7 shall be used for long duration shoulder work on bridge structures.



Shoulder Work
Long Duration (greater than 1 day)
All Volumes

V	50	60-70	80-90	100
A	350	350	500	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

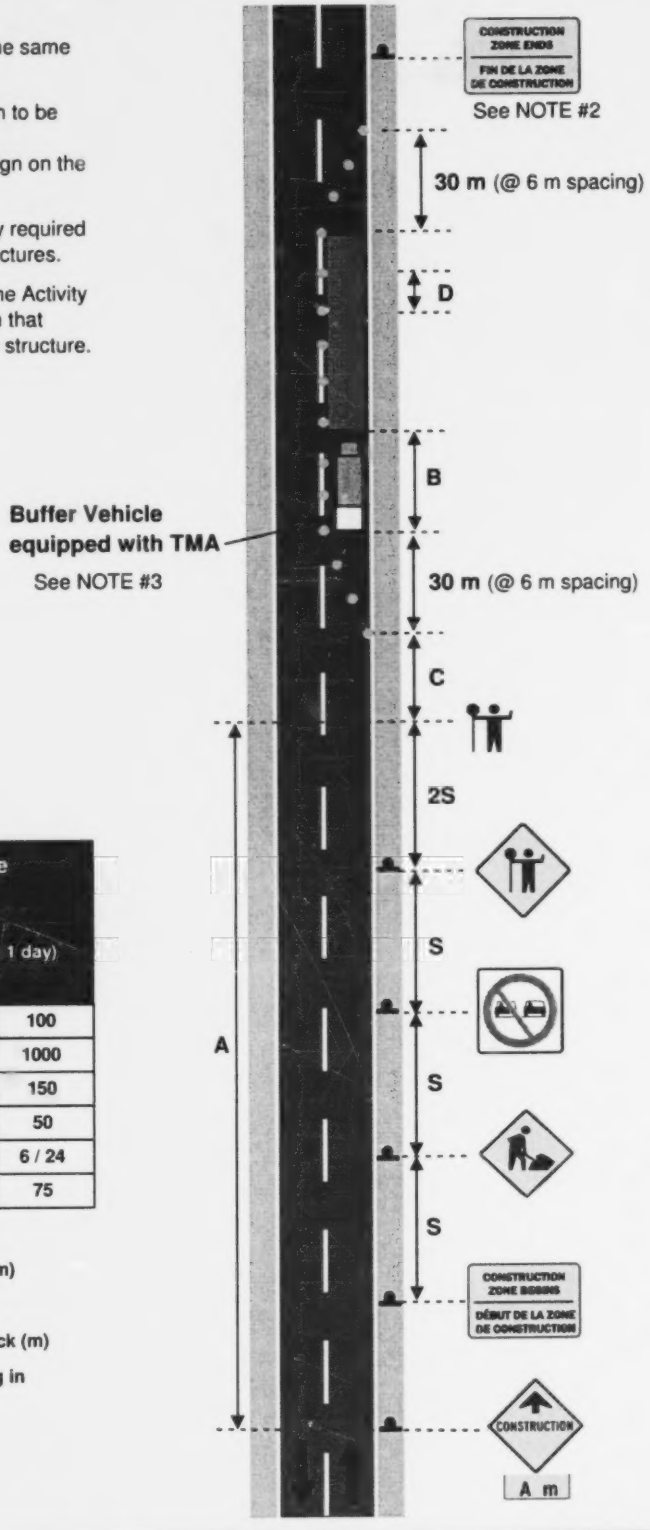
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 7-4

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Buffer Vehicle with TMA only required when working on bridge structures.
4. When working on bridges, the Activity Area shall be extended such that TCPs are not located on the structure.



Single Lane Closure (inc. Bridges) Short Duration (greater than 30 min. less than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
C	30	40	50	50
D	6 / 8	6 / 10	6 / 14	6 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

C – Traffic Control Person Setback (m)

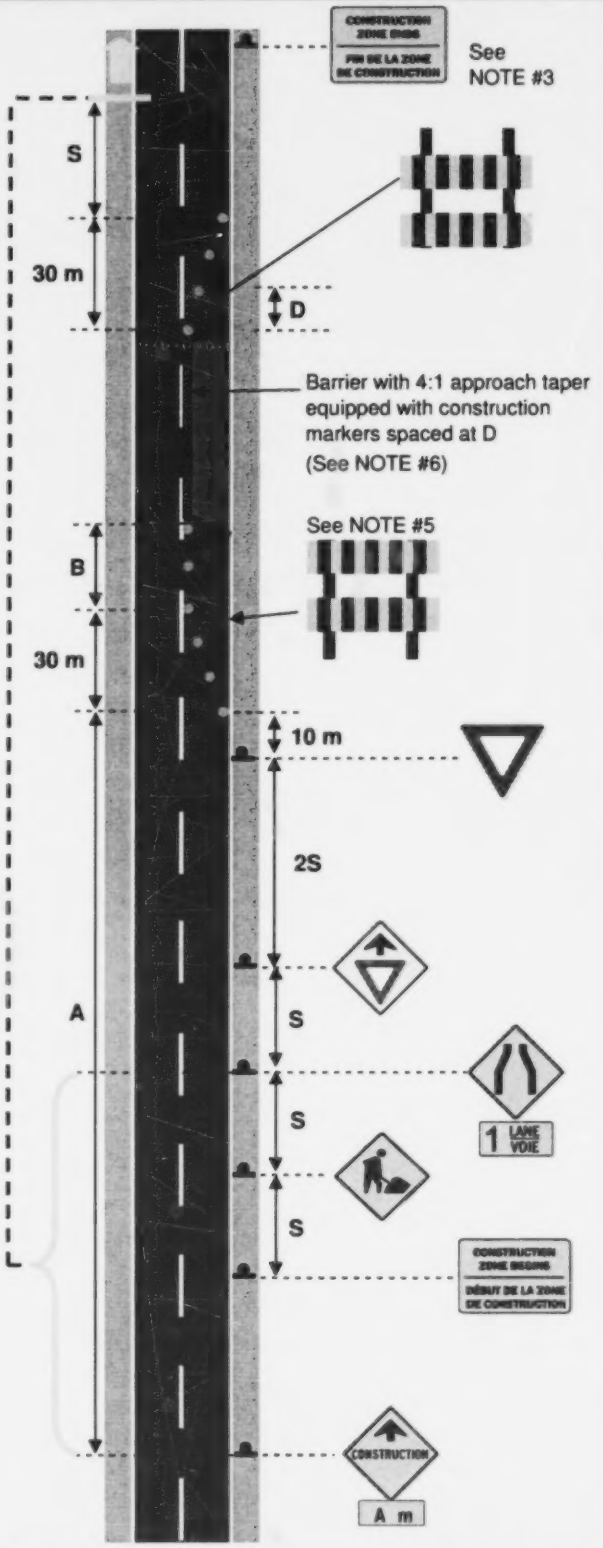
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 7-5

NOTES:

1. Layout requires approval from the Department of Transportation's Maintenance and Traffic Branch.
2. Sign opposite approach in the same manner, without the Yield Ahead and Yield signs.
3. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
4. Tapers shall be at least 30 m in length, and have a delineator spacing of 6 m.
5. Flashing arrow boards (set to the caution mode) may be used in place of barricade boards.
6. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
7. For work on bridge structures, a continuous Barrier is required for all Long Duration Work.



Single Lane Closure (inc. Bridges) Long Duration (greater than 1 day) AADT less than 300 vehicles per day				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	6 / 10	6 / 14	6 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

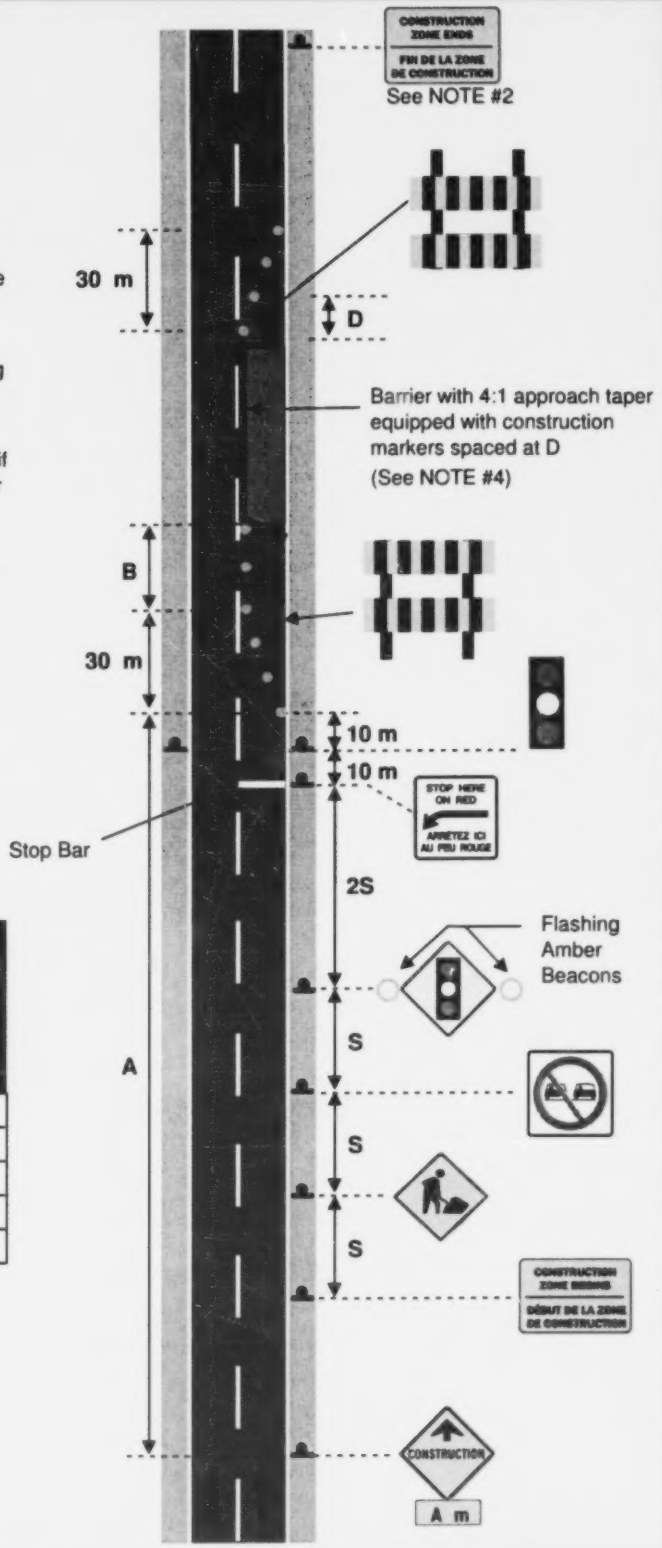
S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

NOTES:

1. Layout requires approval from the Department of Transportation's Maintenance and Traffic Branch.
2. Sign opposite approach in the same manner.
3. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
4. Tapers should be at least 30 m in length, and have a delineator spacing of 6 m.
5. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less (except for work on bridges).
6. For work on bridge structures, a continuous Barrier is required for all Long Duration Work.



Single Lane Closure (inc. Bridges) Long Duration (greater than 1 day) AADT greater than 300 vehicles per day				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	6 / 10	6 / 14	6 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

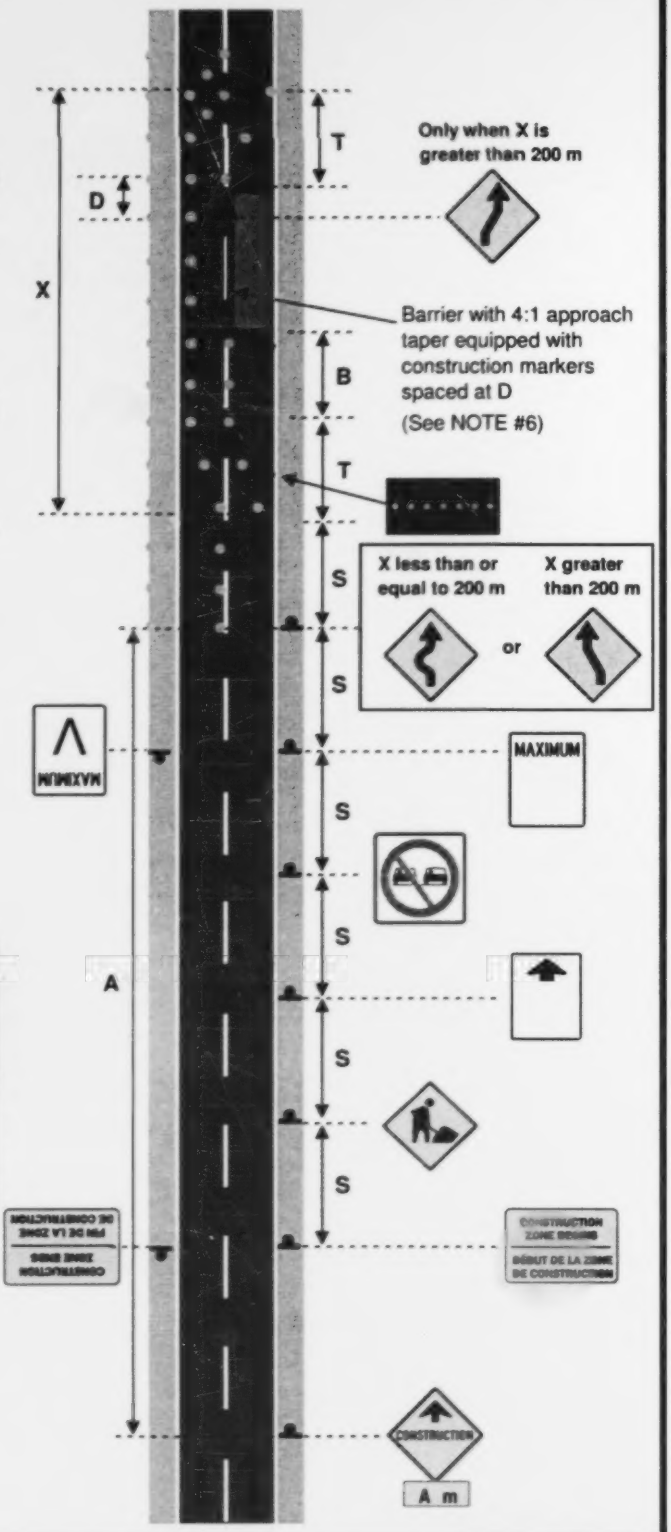
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 7-7

NOTES:

1. Sign opposite approach as shown in Figure 7-8b.
2. X is the length of the Diversion.
3. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation's Maintenance & Traffic Branch.
4. Speed reductions are not required where the original speed limit is 80 km/hr or less.
5. A minimum shoulder width of 2.5 m is required. The shoulder shall be paved for original speeds of 80 km/h or higher.
6. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
7. Confusing pavement markings must be removed.



Shoulder Diversion Short or Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

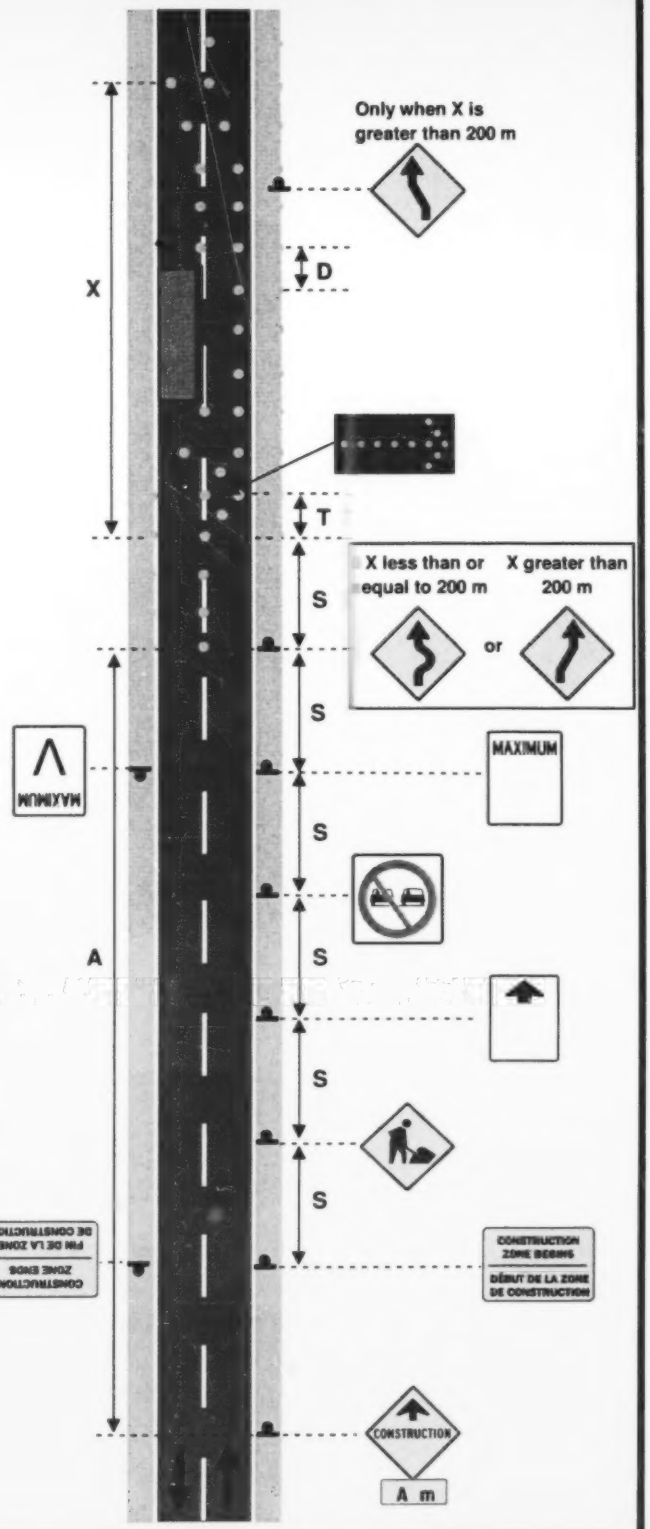
T – Taper Length (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

NOTES:

1. Sign opposite approach as shown in Figure 7-8a.
2. Speeds shall not be reduced more than 20 km/hr below the original speed limit unless approved by the Department of Transportation's Maintenance & Traffic Branch.
3. Speed reductions are not required where the original speed limit is 80 km/h or less.
4. Confusing pavement markings must be removed.



Shoulder Diversion Short or Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

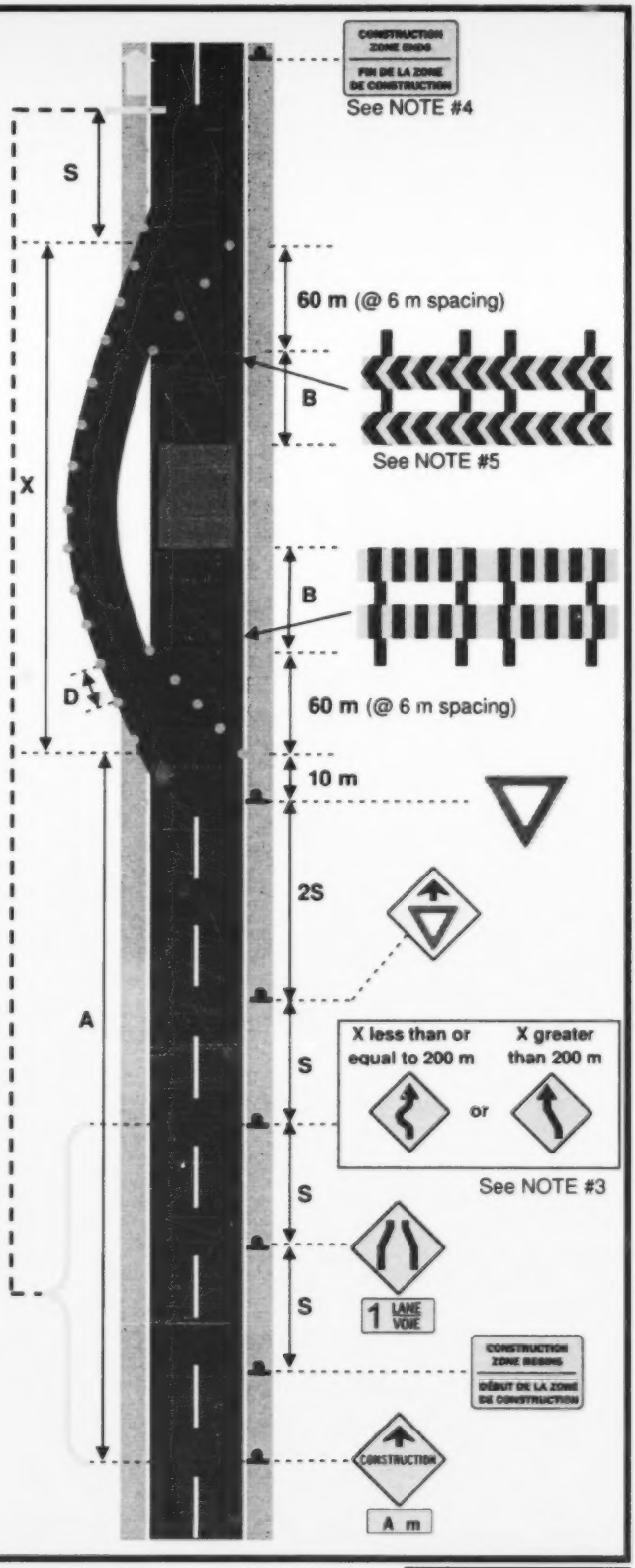
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 7-8b

NOTES:

1. Layout requires approval from the Department of Transportation's Maintenance and Traffic Branch.
2. Sign opposite approach in the same manner, without the Yield Ahead and Yield signs.
3. Other direction shall be displayed on opposite approach and shall be accompanied by Speed Advisory Tabs.
4. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
5. Flashing Arrow Boards (set to the caution mode) may be used in place of Barricade boards.
6. X is the length of the Diversion.
7. Centreline markings must be removed from the Transition Area and replaced by temporary markings.



Single Lane Diversion Long Duration (greater than 1 day) AADT less than 300 vehicles per day				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

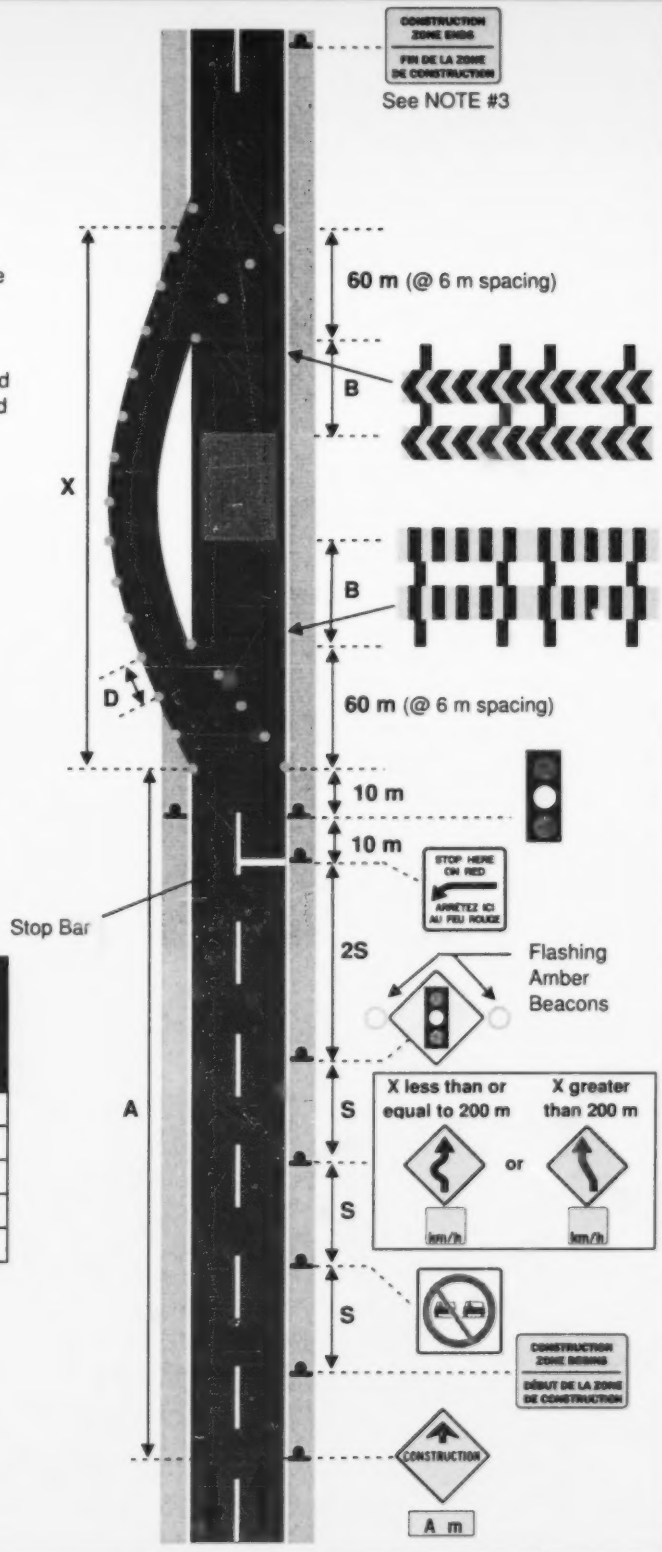
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 7-9

NOTES:

1. Layout requires approval from the Department of Transportation's Maintenance and Traffic Branch.
2. Sign opposite approach in the same manner.
3. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
4. X is the length of the Diversion.
5. Centreline markings must be removed from the Transition Area and replaced by temporary markings.



Single Lane Diversion Long Duration (greater than 1 day) AADT greater than 300 vehicles per day				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

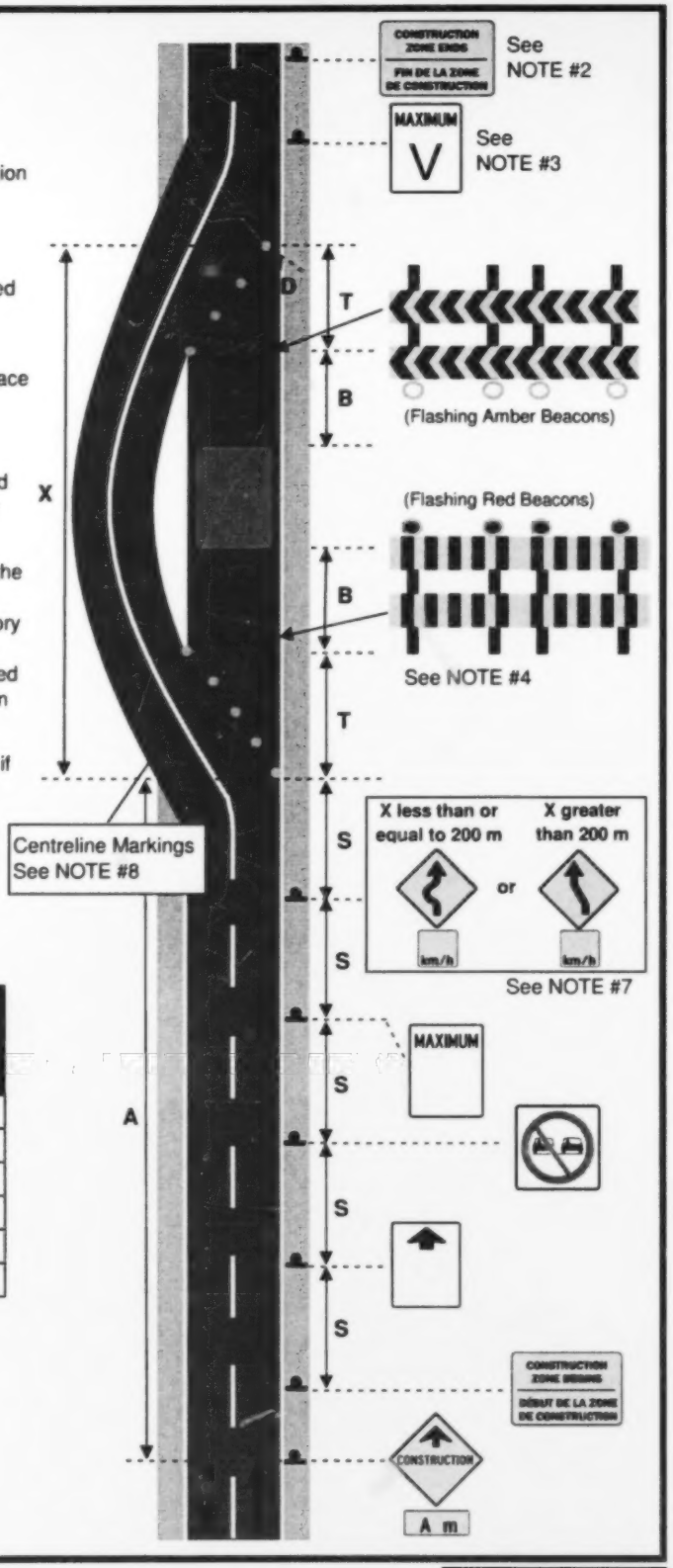
S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Flashing Arrow Boards (set to the appropriate mode) may be used in place of Barricade boards.
5. X is the length of the Diversion.
6. Centreline markings must be removed from Transition Area and replaced by temporary markings.
7. Advisory speed to be determined by the Department of Transportation's Maintenance & Traffic Branch. Advisory Speeds Tabs are only required if the difference between the diversion speed and the reduced speed is greater than 10 km/h.
8. Centreline markings are not required if existing road is not marked.



Two Lane Diversion (Surfaced) Long Duration (greater than 1 day) All Volumes

V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

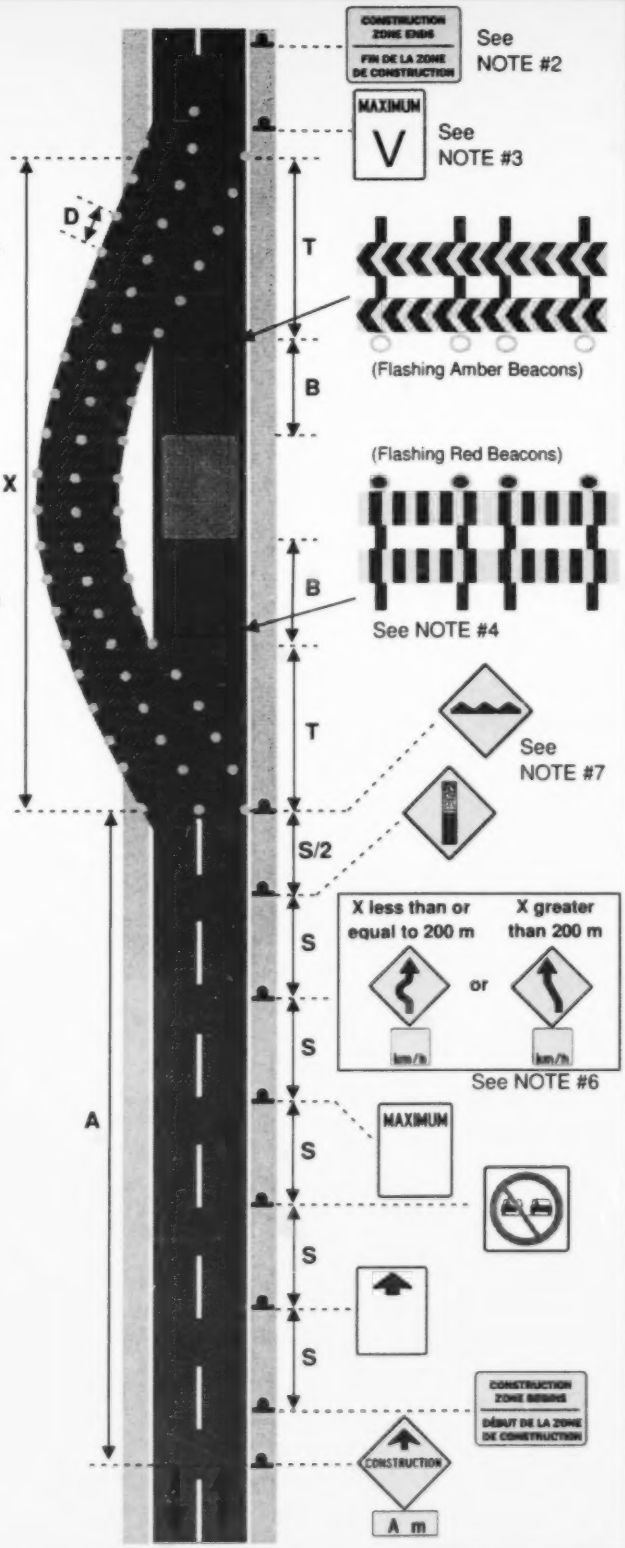
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 7-11

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Flashing Arrow Boards (set to the appropriate mode) may be used in place of barricade boards.
5. X is the length of the Diversion.
6. Advisory speed to be determined by the Department of Transportation's Maintenance & Traffic Branch. Advisory Speeds Tabs are only required if the difference between the diversion speed and the reduced speed is greater than 10 km/h.
7. Bump sign to be used only if required.
8. Centreline markings must be removed from Transition Area and replaced by temporary markings.



Two Lane Diversion (Unsurfaced) Long Duration (greater than 1 day) All Volumes				
V	50	60-70	80-90	100
A	500	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

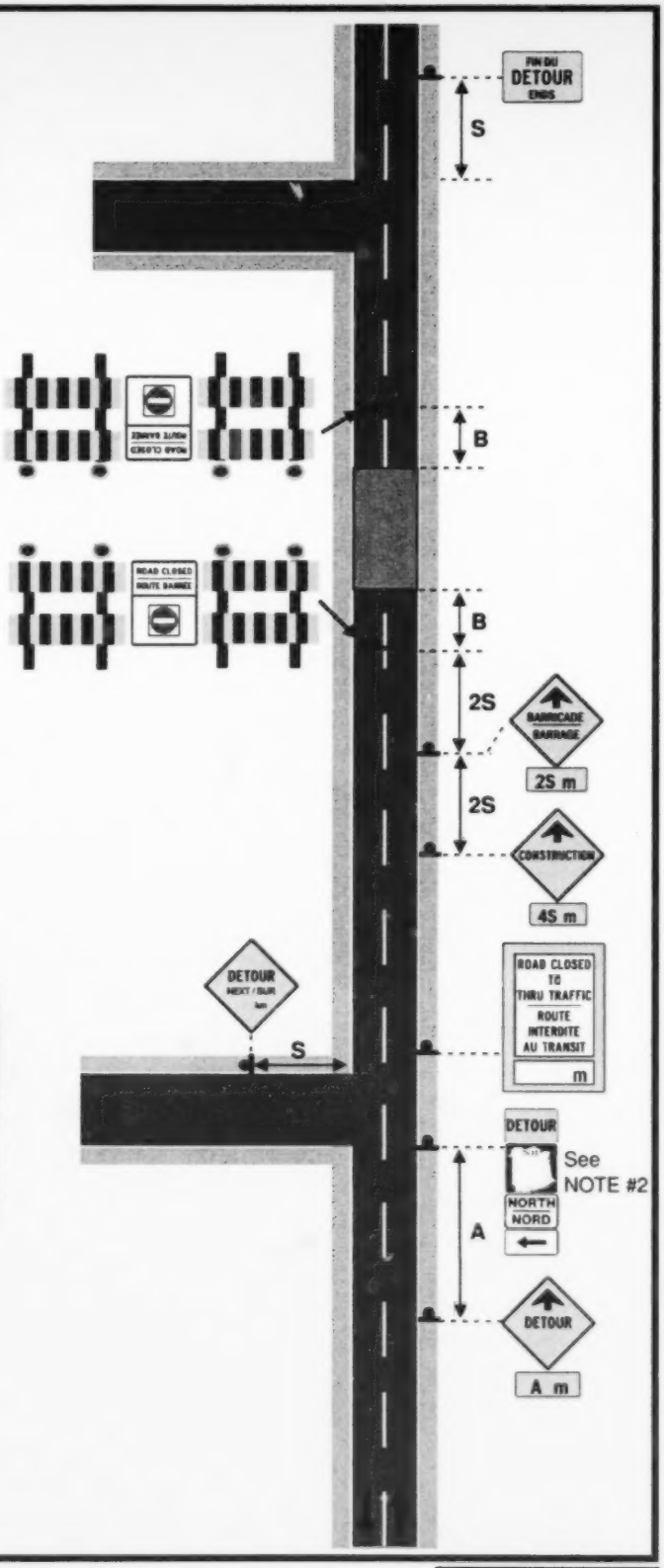
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 7-12

NOTES:

1. Sign other approach in the same manner.
2. All intersections along the Detour route shall display appropriate guide signs to clearly direct drivers along the intended path.



Rural Detour Any Duration All Volumes				
V	50	60-70	80-90	100
A	300	300	300	300
S	50	75	100	150
B	35	50	70	75

V – Existing Speed Limit (km/h)

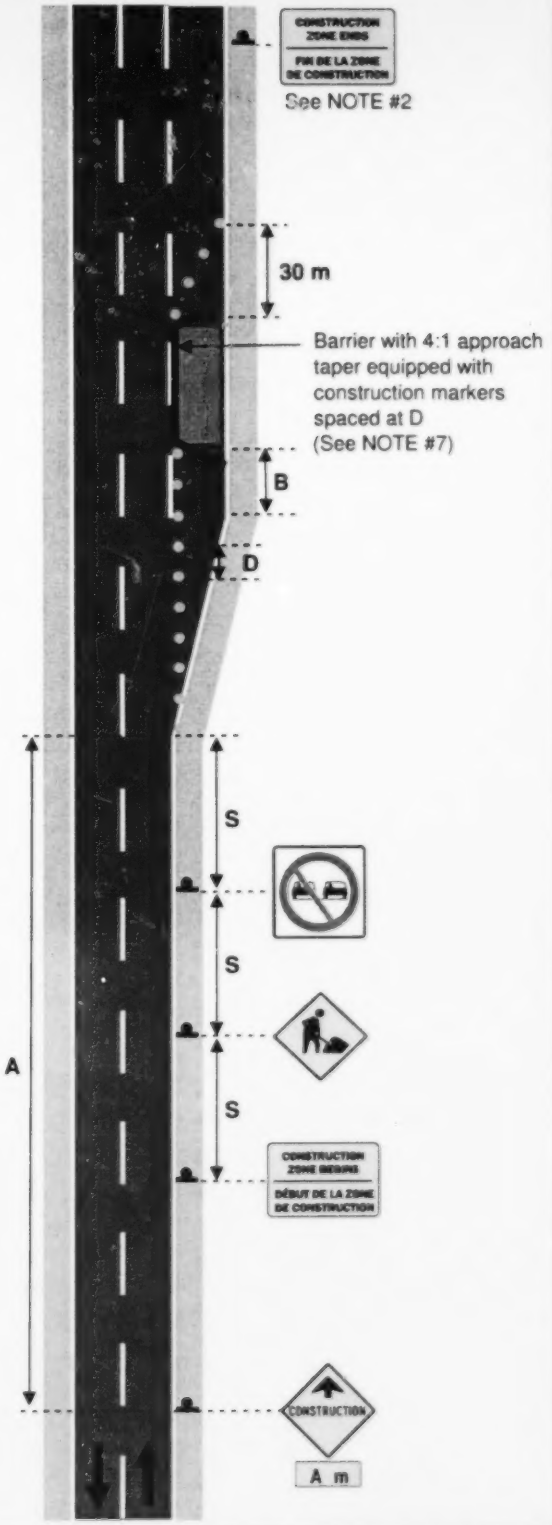
A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

B – Buffer Area Length (m)

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Climbing Lane 2 km signs and Keep Right Except to Pass sign must be covered.
4. If less than 1 km of climbing lane remains beyond the Activity Area, close the entire climbing lane.
5. If more than 1 km of climbing lane remains beyond the Activity Area, a Keep Right Except to Pass sign shall be posted immediately following the termination taper
6. If more than 1 km of climbing lane is available before the activity area, the initial portion of the climbing lane may remain open until closed using Figure 8-7 (double posting required on opposite approach shoulder).
7. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
8. Termination Taper shall be at least 30 m in length, and have a delineator spacing of 6 m.



Climbing Lane (Uphill Right Lane) Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	350	500	1000
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

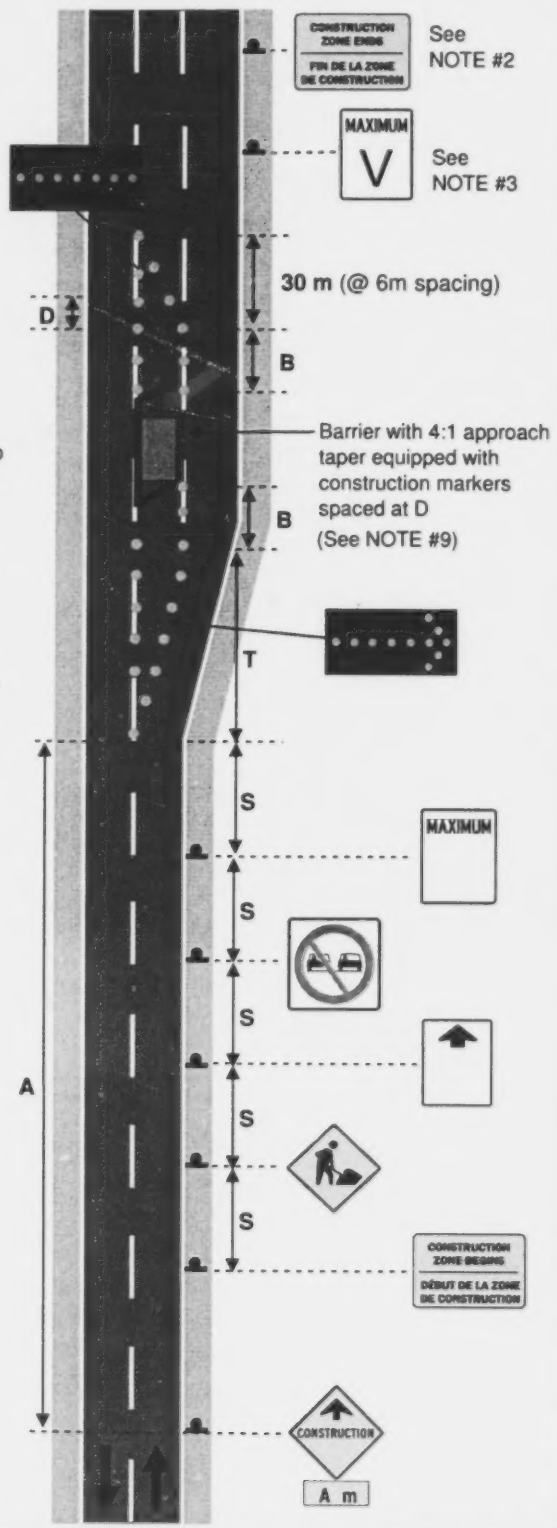
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 7-14

NOTES:

1. Sign opposite approach in a similar manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Climbing Lane 2 km signs and Keep Right Except to Pass sign must be covered.
5. If less than 1 km of climbing lane remains beyond the Activity Area, close the entire climbing lane.
6. If more than 1 km of climbing lane remains beyond the Activity Area, a Keep Right Except to Pass sign shall be posted immediately following the termination taper
7. If more than 1 km of climbing lane is available before the activity area, the initial portion of the climbing lane may remain open until closed using Figure 8-7 (double posting required on opposite approach shoulder).
8. Speeds shall not be reduced more than 20 km/h below the posted speed limit.
9. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.



Climbing Lane (Uphill Centre Lane) Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 7-15

NOTES:

1. Sign opposite approach in a similar manner, beginning a distance "S" before the Road Realignment sign.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Climbing Lane 2 km signs and Keep Right Except to Pass signs must be covered.
5. If less than 1 km of climbing lane remains beyond the Activity Area, close the entire climbing lane.
6. If more than 1 km of climbing lane remains beyond the Activity Area, a Keep Right Except to Pass sign shall be posted immediately following the transition taper
7. If more than 1 km of climbing lane is available before the Activity Area, the initial portion of the climbing lane may remain open until closed using Figure 8-7 (double posting required on opposite approach shoulder).
8. Speeds shall not be reduced more than 20 km/h below the posted speed limit.
9. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.

Climbing Lane (Downhill Lane) Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

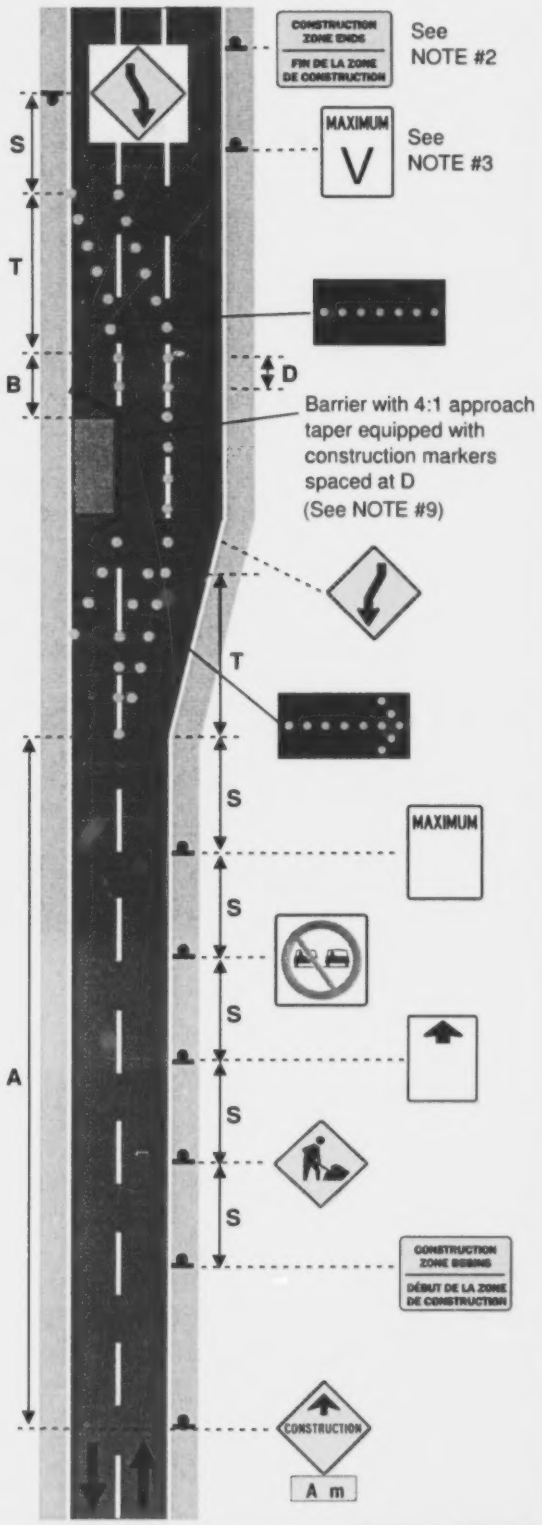
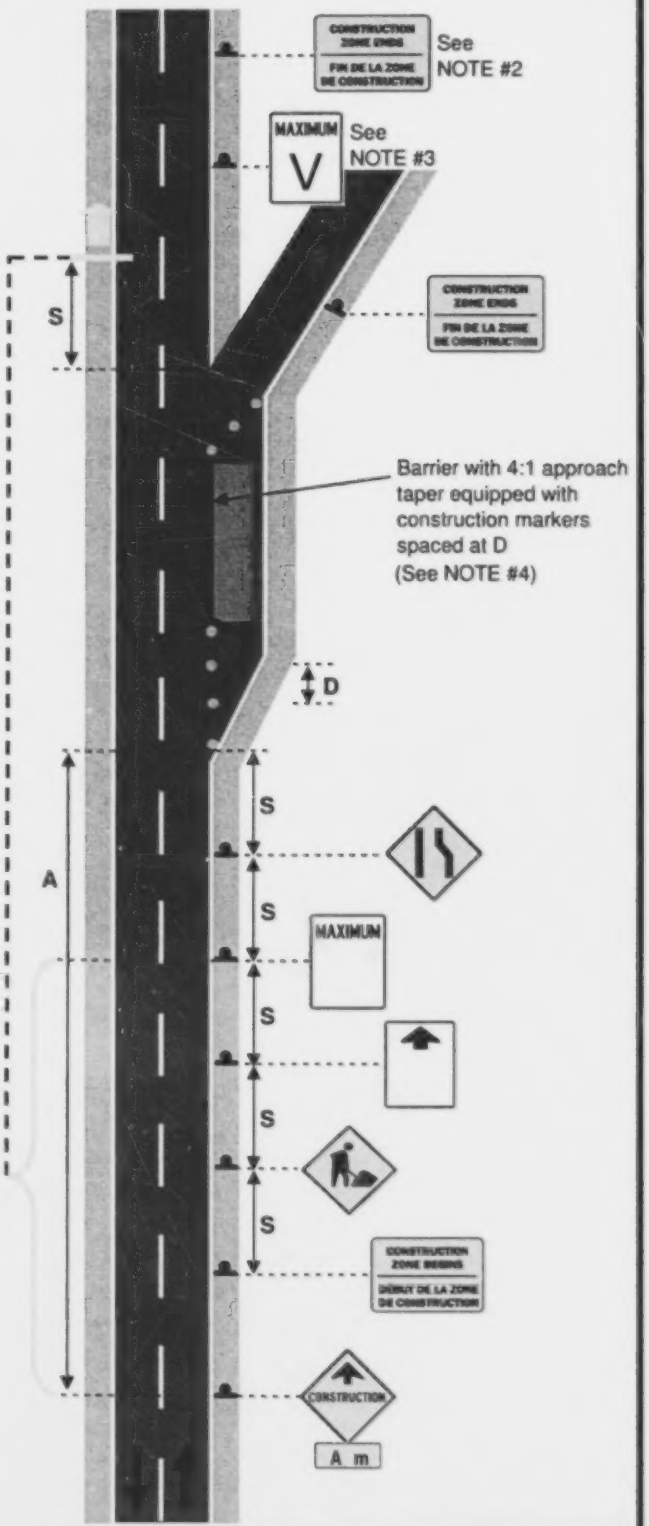


Figure 7-16

NOTES:

1. Sign opposite main lane approach in the same manner, without the Road Narrows sign.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.



Deceleration Lane Closure Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

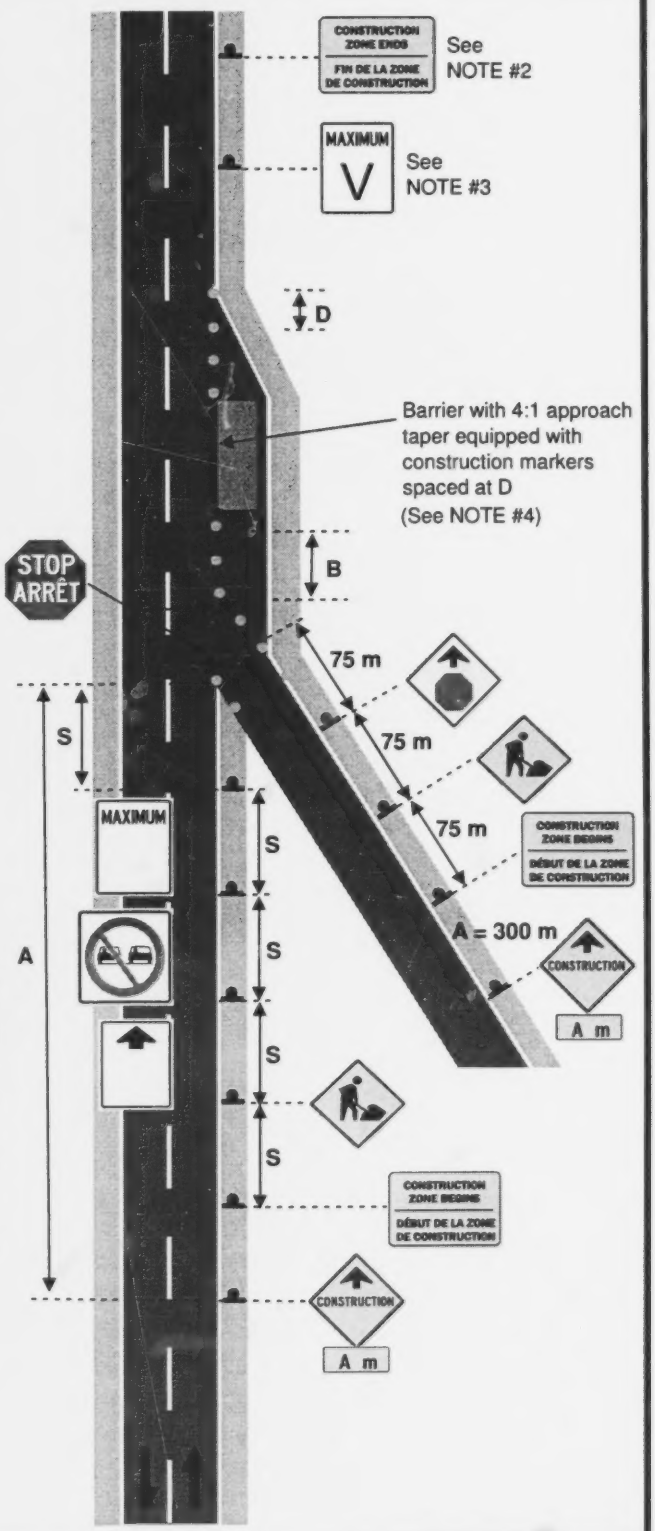
D – Maximum Delineator Spacing (m)

B – Buffer Area Length (m)

Figure 7-17

NOTES:

1. Sign opposite main lane approach in the same manner, beginning at the end of the acceleration lane.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.



Acceleration Lane Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

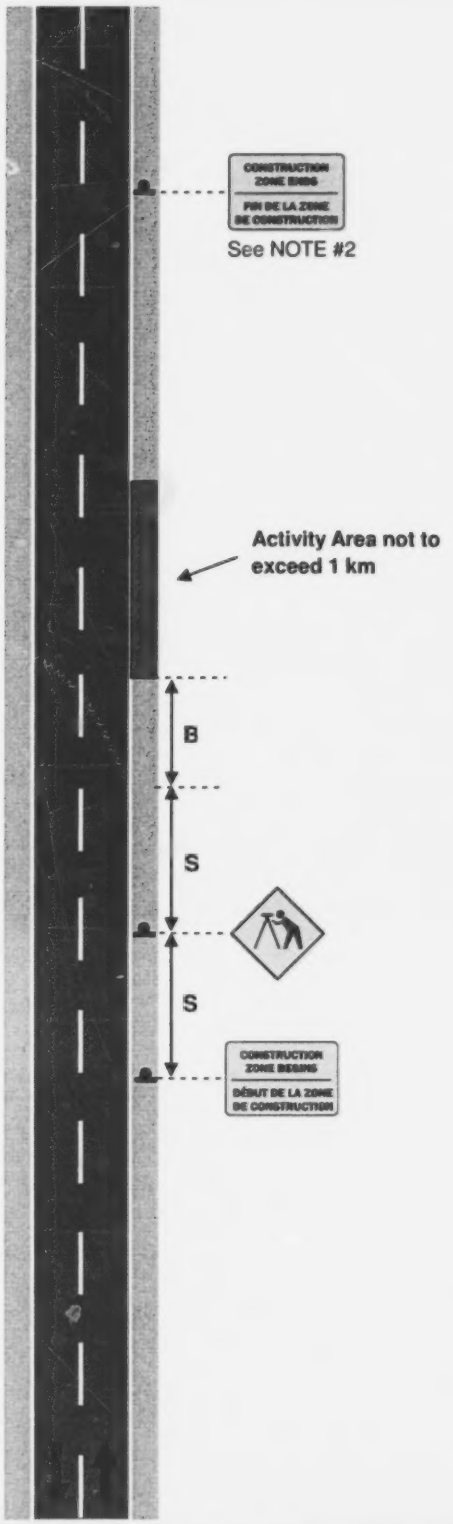
D – Maximum Delineator Spacing (m)

B – Buffer Area Length (m)

Figure 7-18

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be place directly across from Construction Zone Begins sign on the opposite approach.
3. A Dedicated Traffic Observer shall be used for survey work that requires occasional trips onto or across the travel lanes.



Surveying (Shoulder) Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100
S	50	75	100	150
B	35	50	70	75

V – Existing Speed Limit (km/h)

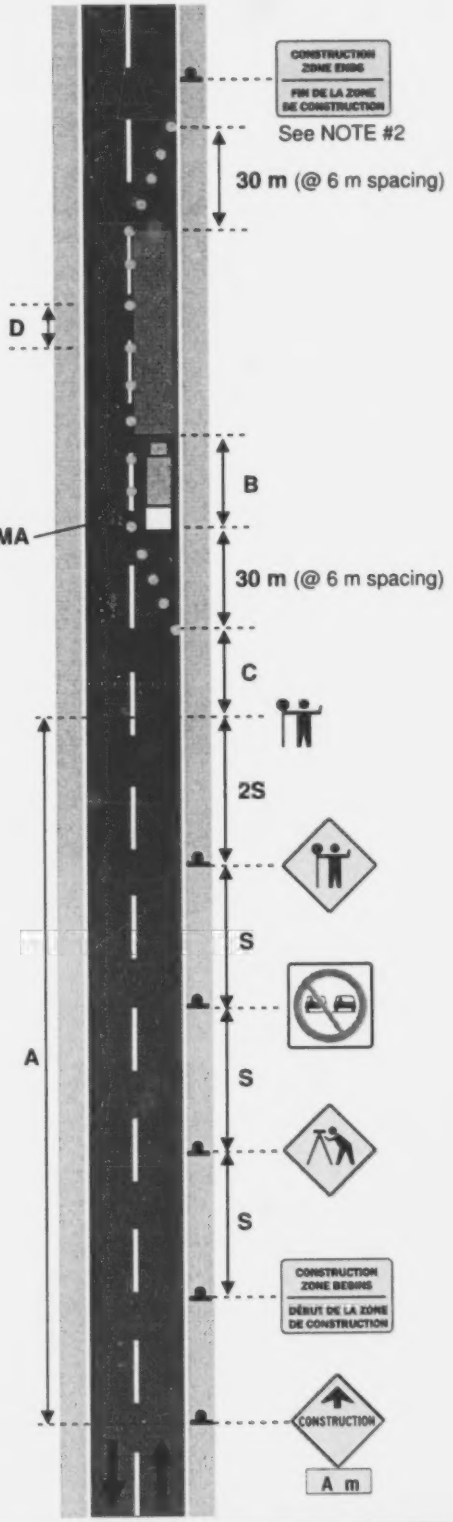
S – Minimum Sign Spacing (m)

B – Buffer Distance (m)

Figure 7-19

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Buffer Vehicle with TMA only required when working on bridge structures.
4. When working on bridges, the Activity Area shall be extended such that TCPs are not located on the structure.



Surveying (Lane Closure)
Short Duration
(greater than 30 min, less than 1 day)
All Volumes

V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
C	30	40	50	50
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

C – Traffic Control Person Setback (m)

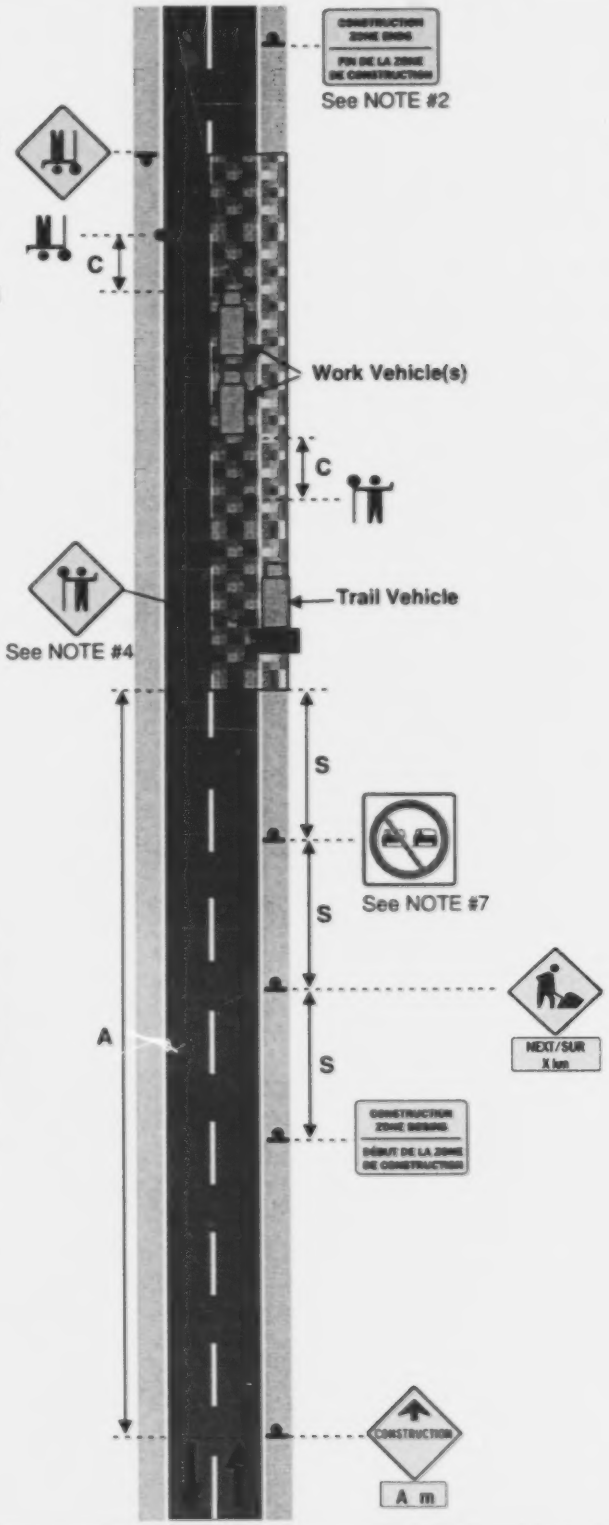
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 7-20

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. The length of the Activity Area shall not exceed 2 km.
4. Traffic Control Person Ahead signs shall be positioned within 2S m to 3S m of the TCP at all times (shall be mounted on Trail Vehicle where used).
5. All work vehicles shall be equipped with 360 degree amber lights as a minimum.
6. Trail vehicle not required on roads with a speed limit of 80 km/h or less.
7. No passing sign is optional on roads with less than 300 vehicles per day.



Patching Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	350	500	1000
S	50	75	100	150
C	30	40	50	50

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

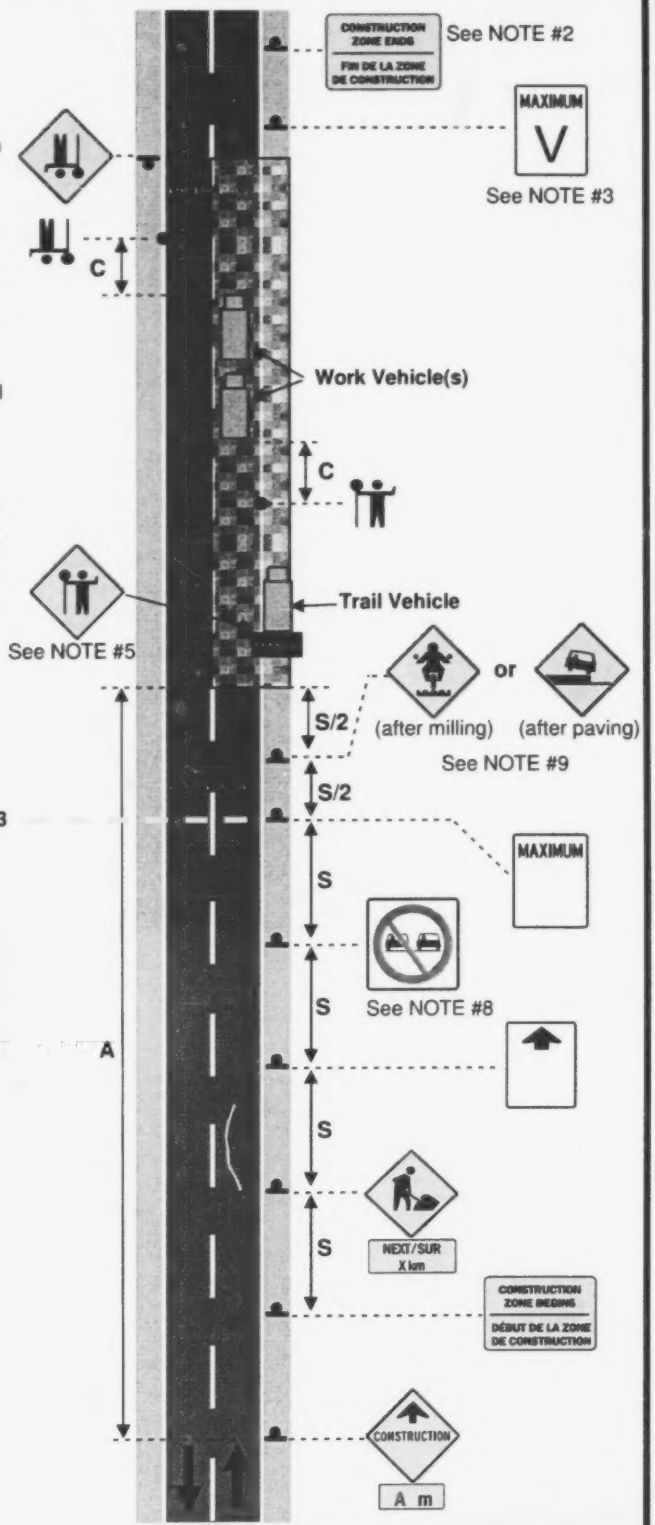
C – Traffic Control Person Setback (m)

Figure 7-21

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. The length of the Activity Area shall not exceed 2 km.
5. Traffic Control Person Ahead signs shall be positioned within 2S m to 3S m of the TCP at all times (shall be mounted on trail vehicle where used).
6. All work vehicles shall be equipped with 360 degree amber lights as a minimum.
7. Trail Vehicle not required on roads with a speed limit of 80 km/h or less.
8. No passing sign is optional on roads with less than 300 vehicles per day.
9. Repeat appropriate sign every 1 km of milled or paved surface.

MATCH LINE to Figure 7-23



Milling or Paving Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	500	500	1000
S	50	75	100	150
C	30	40	50	50

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

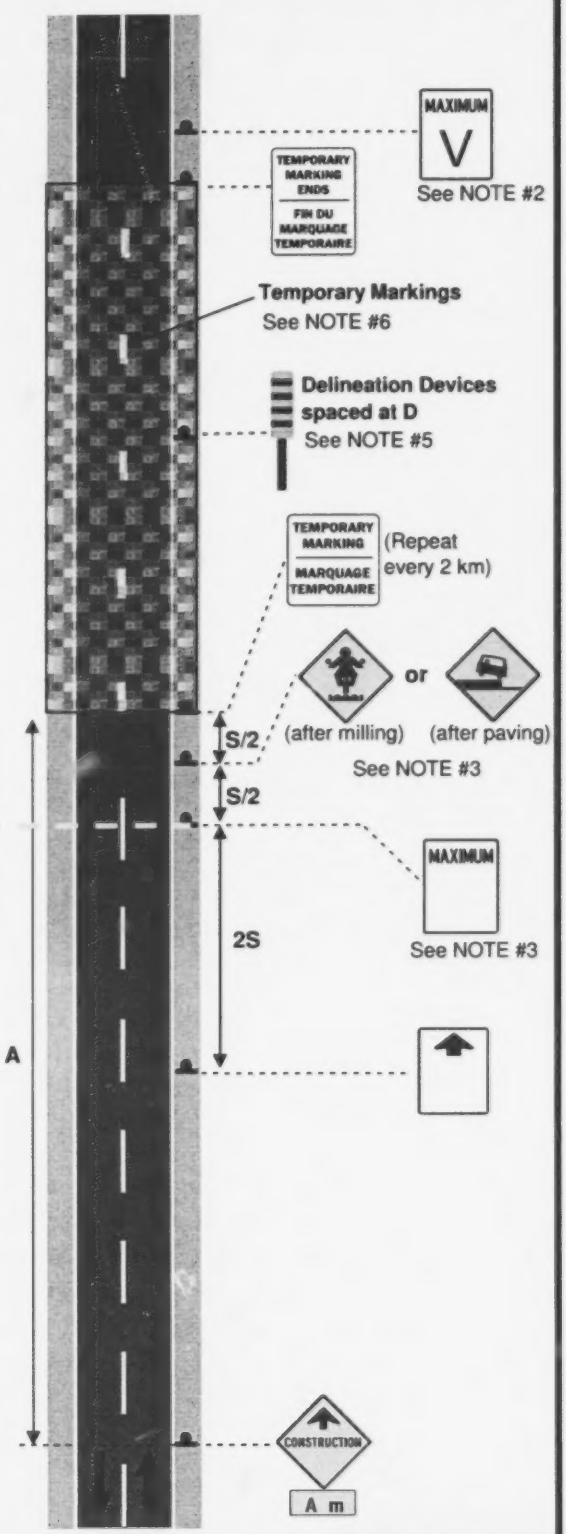
C – Traffic Control Person Setback (m)

Figure 7-22

NOTES:

1. Sign opposite approach in the same manner.
2. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
3. Speed reductions only required with speed limits of 90km/h or greater.
4. Repeat appropriate sign every 1 km of milled or paved surface.
5. Delineation Devices only required where the difference in elevation between the travelled lane and the shoulder is greater than 75 mm. Flexible drums or delineator posts may be used in place of construction markers.
6. Pavement marking tape (or paint) shall be applied in 2 m strips and spaced at 50 m on tangents and 25 m or curves. Raised pavement markers shall be installed on milled surfaces in groupings of three within a 2 m length and be spaced the same as pavement marking tape.
7. If milling involves full depth removal, then Grooved Pavement Sign shall be replaced by Pavement Ends sign.
8. Bump signs shall be used any time there is a differential in surface thickness on the main lanes.

MATCH LINE to Figure 7-22



After Milling or Paving Any Duration All Volumes				
V	50	60-70	80-90	100
A	300	500	1000	1000
S	50	75	100	150
D	8	10	14	24

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

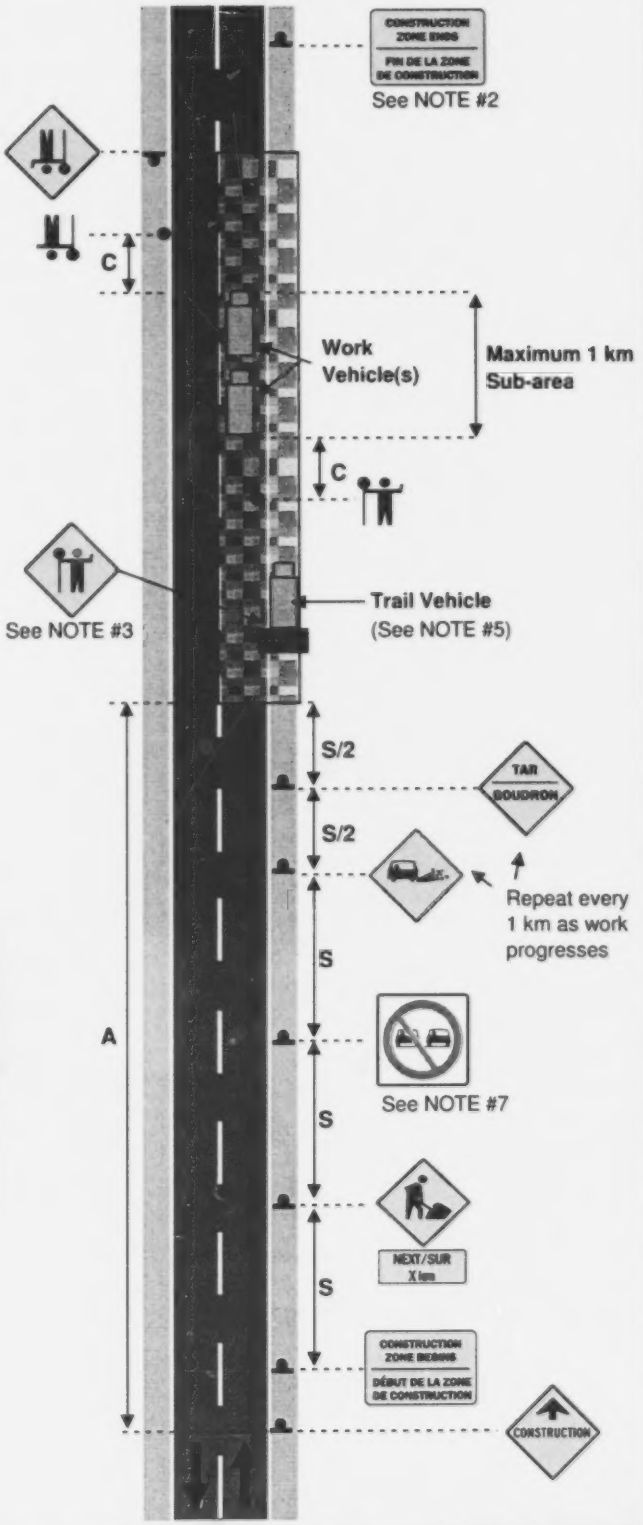
S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing (m)

Figure 7-23

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Traffic Control Person Ahead signs shall be positioned within 2S m to 3S m of the TCP at all times (shall be mounted on trail vehicle).
4. The Activity Area shall not exceed 4 km.
5. All work vehicles shall be equipped with 360 degree amber lights as a minimum.
6. Trail vehicle not required on roads with a speed limit of 80 km/h or less.
7. No passing sign is optional on roads with less than 300 vehicles per day.



Chip Sealing Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
C	30	40	50	50

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

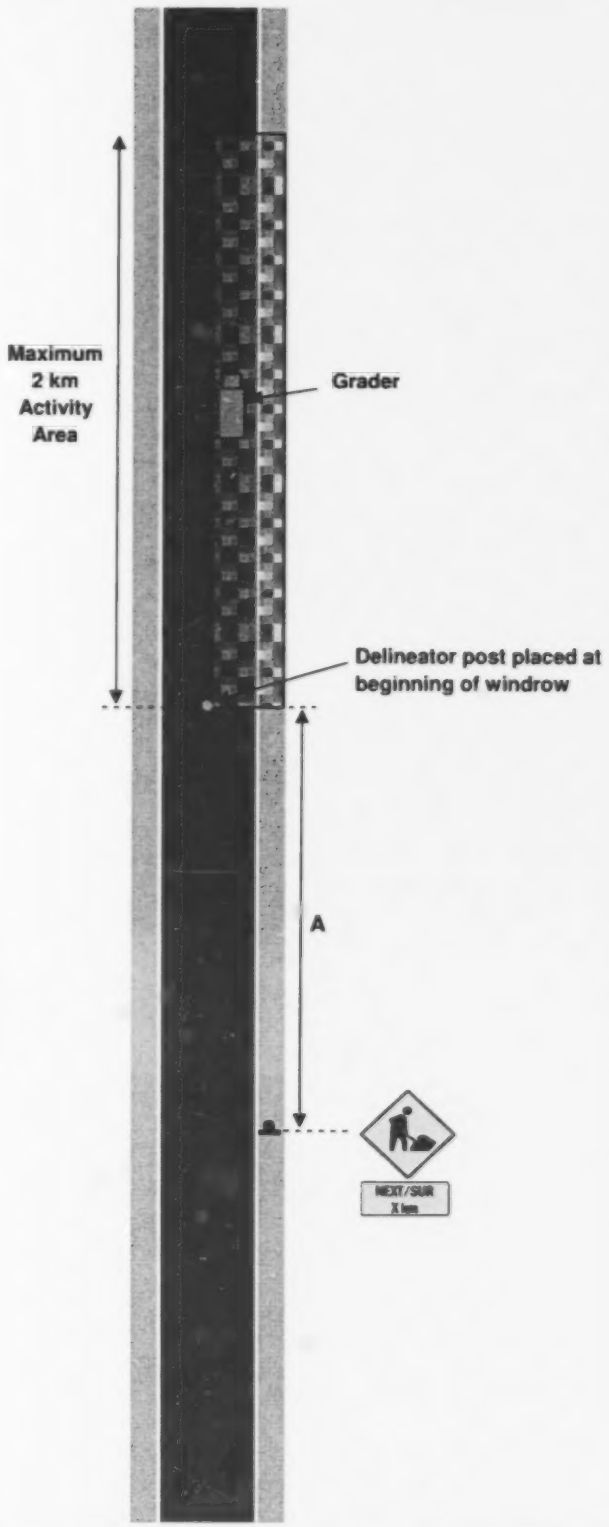
S – Minimum Sign Spacing (m)

C – Traffic Control Person Setback (m)

Figure 7-24

NOTES:

1. This layout shall be used for maintenance activities only.
2. Sign opposite approach in the same manner.
3. Grader shall be equipped with 360 degree amber lights as a minimum.



Grading Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	350	500	1000
S	50	75	100	150

V – Existing Speed Limit (km/h)

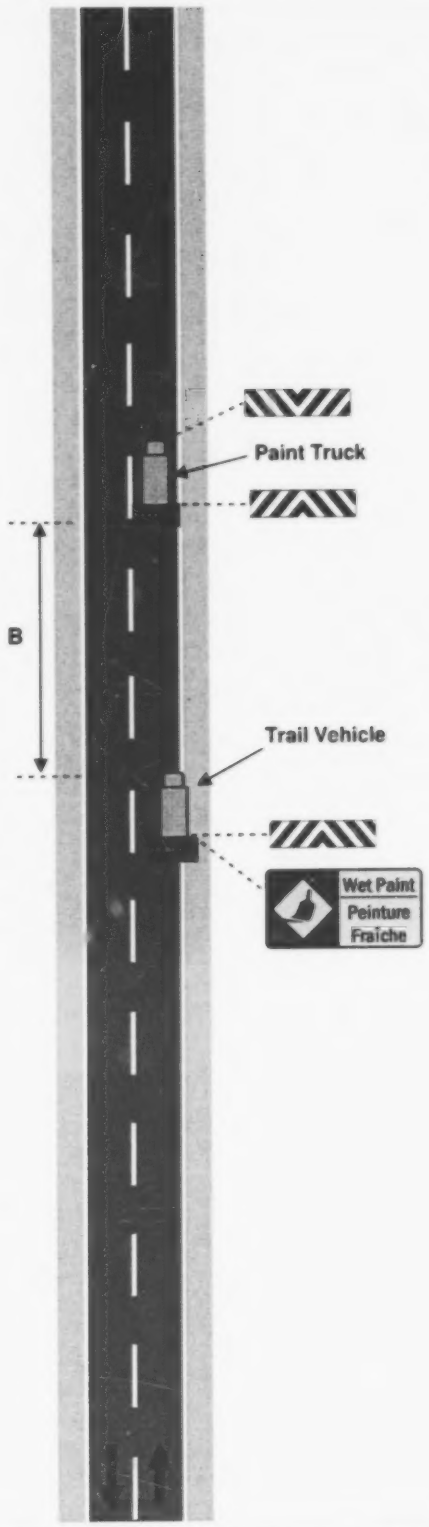
A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

Figure 7-25

NOTES:

1. Both vehicles shall be equipped with a Flashing Arrow Board set to caution mode.



Line Painting Moving Operation All Volumes				
V	50	60-70	80-90	100
B	35	50	70	75

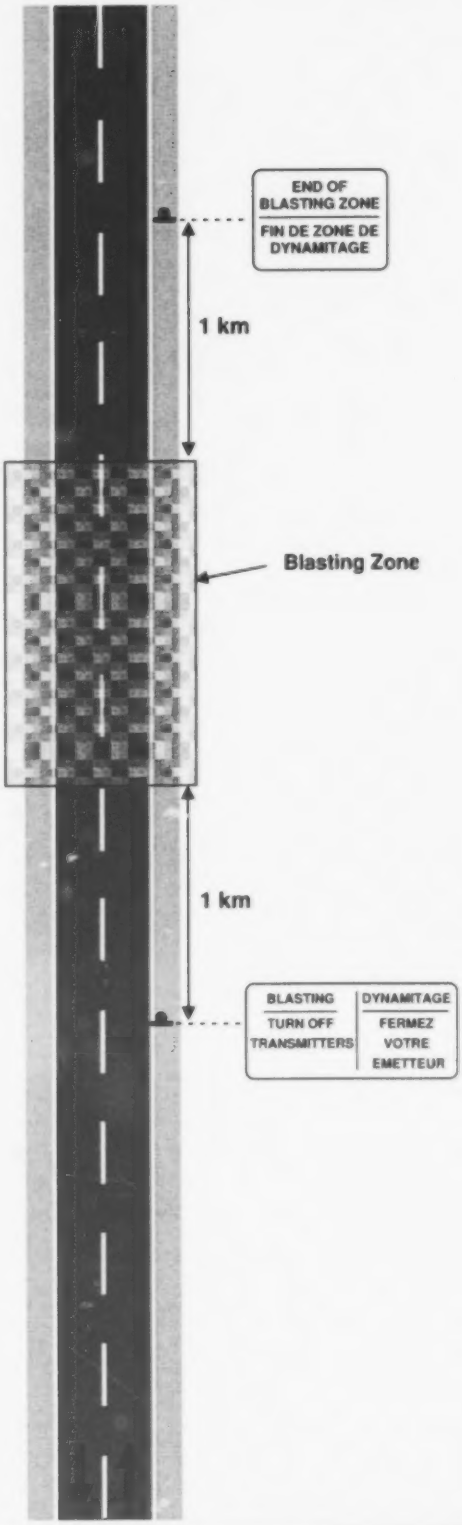
V – Existing Speed Limit (km/h)

B – Buffer Distance (m)

Figure 7-26

NOTES:

1. Sign opposite approach in the same manner.

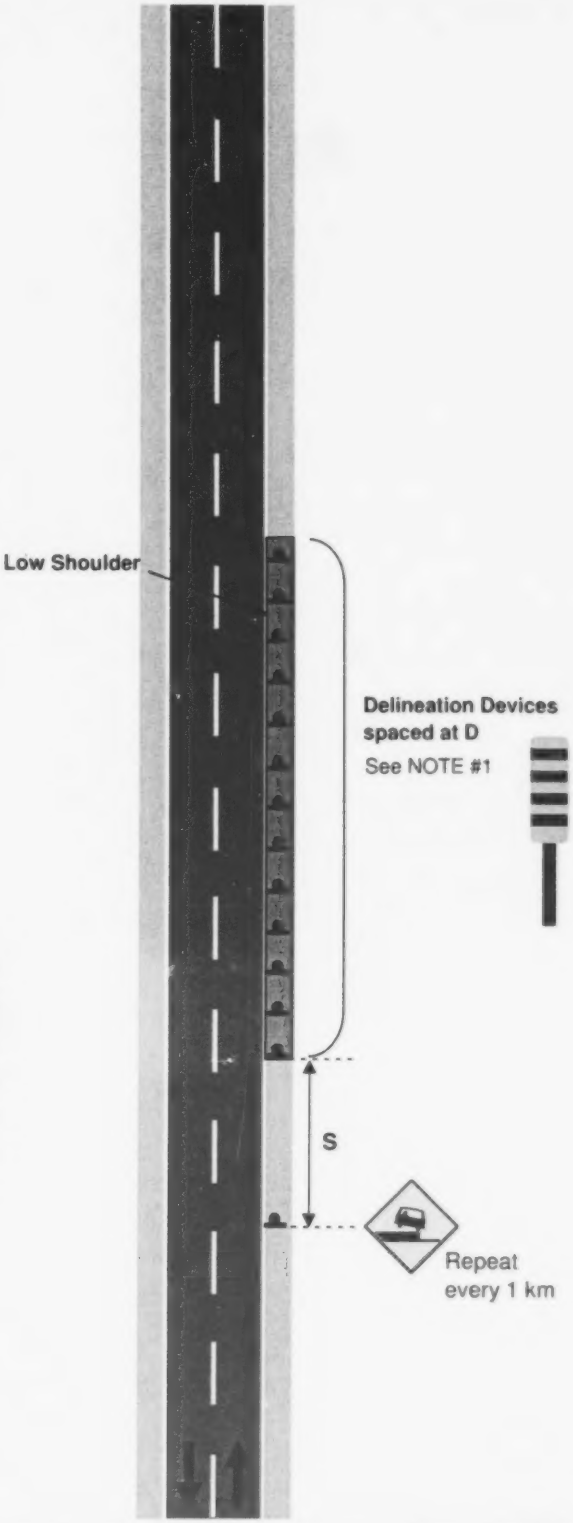


Blasting Zone
Any Duration
All Volumes

Figure 7-27

NOTES:

1. Delineation Devices only required where the difference in elevation between the travelled lane and the shoulder is greater than 75 mm.



Low Shoulder Any Duration All Volumes				
V	50	60-70	80-90	100
S	50	75	100	150
D	8	10	14	24

V – Existing Speed Limit (km/h)

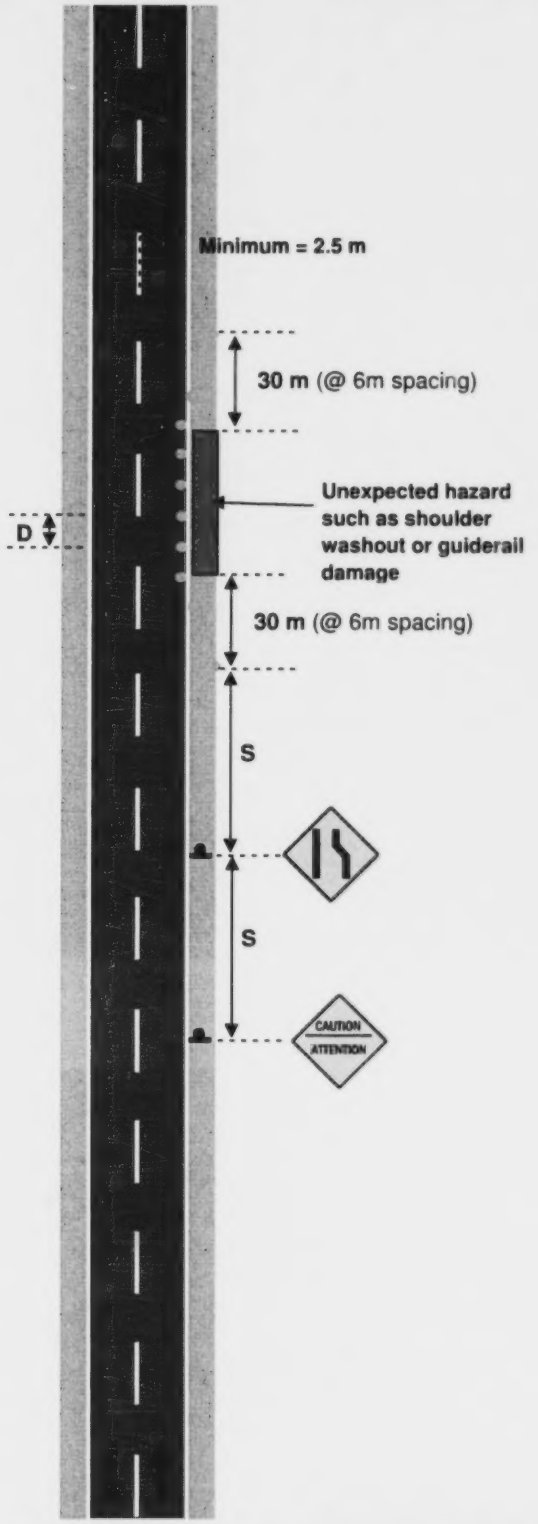
S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing (m)

Figure 7-28

NOTES:

1. This layout shall only be used to delineate the hazard until it can be fixed, at which time an appropriate layout such as Figure 7-2, 7-3, 7-4 must be used.



Other Hazards Any Duration All Volumes				
V	50	60-70	80-90	100
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24

V – Existing Speed Limit (km/h)

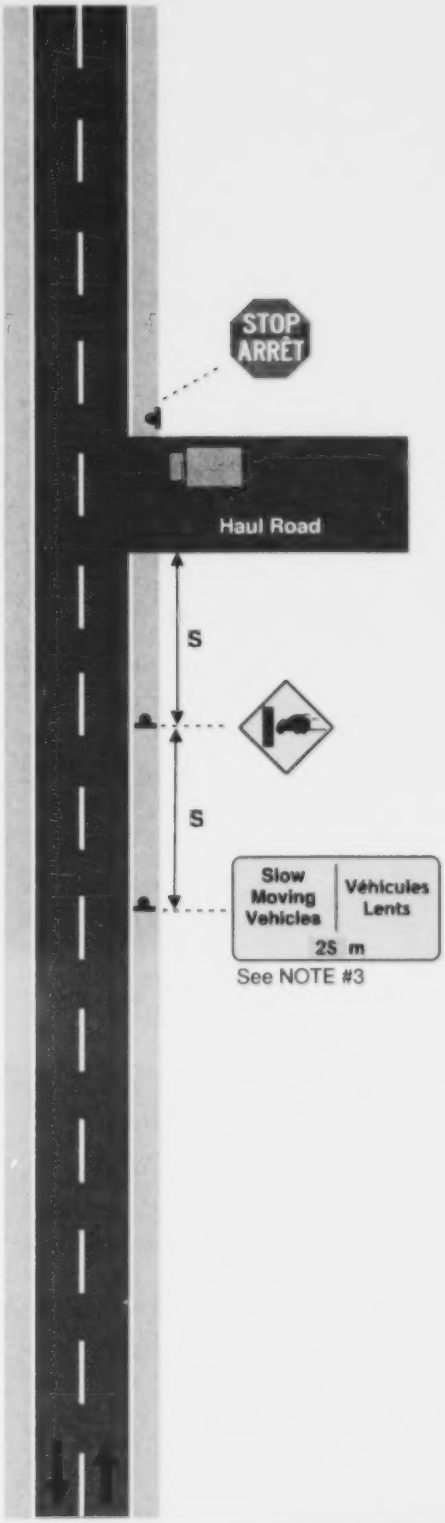
S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

Figure 7-29

NOTES:

1. Sign opposite approach in the same manner.
2. Signs are only required where there are more than 50 trucks entering per day or where off-road vehicles are crossing.
3. Slow Moving Vehicles sign to be used only where mainline AADT exceeds 5000 vpd and truck volumes using the haul road exceed 200 vpd.
4. The Left Truck Entrance sign shall be used on both approaches where trucks are crossing the road.



Temporary Haul Roads Any Duration All Volumes				
V	50	60-70	80-90	100
S	50	75	100	150

V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

NOTES:

1. Sign opposite approach in the same manner.
2. Do not repeat Construction Ahead or Construction Zone Begins.
3. Only use sign when applicable.
4. When merging Figure 7-31 with other typical layouts, the distance A shall be referenced to the same location as in the accompanying layout.

Advance Signing (Major Project) Long Duration All Volumes				
V	50	60-70	80-90	100
A	500	1000	1500	2000
S	50	75	100	150

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

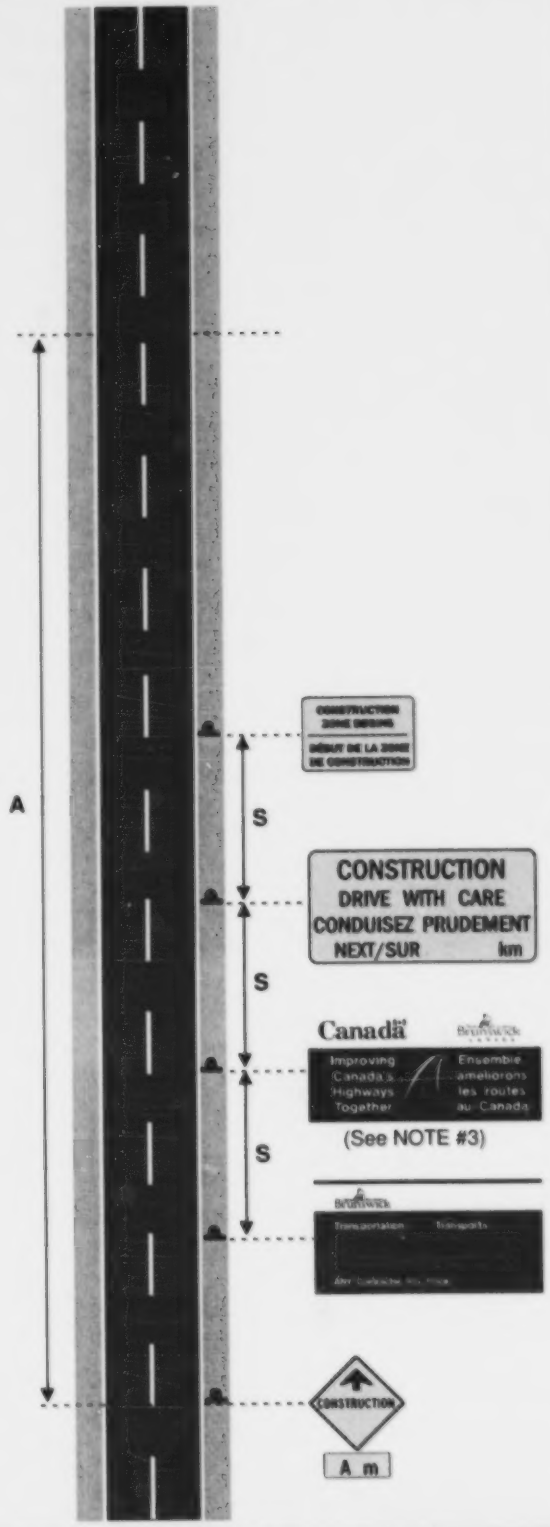


Figure 7-31

8 Typical Layouts for Multilane Roads

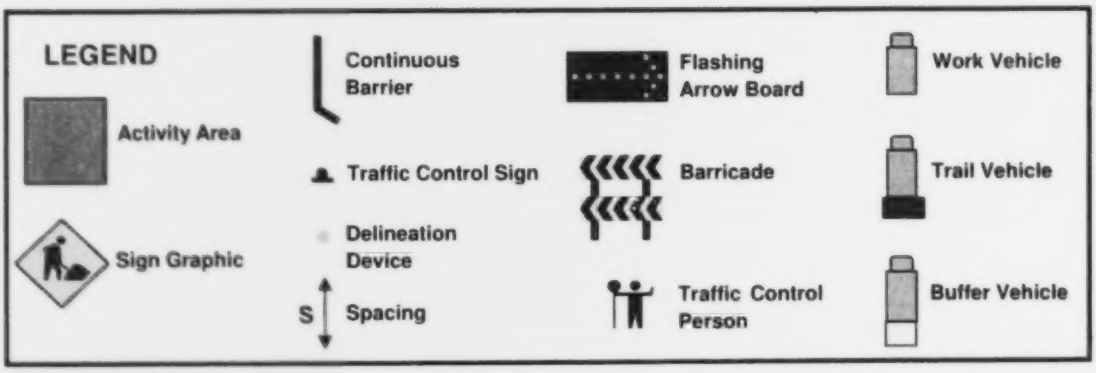
GENERAL LAYOUTS

Activity	Work Location	Duration	Volume	Figure No.
Any	Roadside	Any	All	8-1
	Shoulder	Moving	All	8-2
		Very Short	All	8-3
		Short	All	8-4
		Long	All	8-5
	Single Lane	Moving	All	8-6
		Short / Long	All	8-7
Multilane Diversion	Two Lanes	Short / Long	All	8-8a&b
Bridge	Single Lane	Short / Long	All	8-9
Auxiliary Lane	Deceleration Lane	Short / Long	All	8-10
	Acceleration Lane	Short / Long	All	8-11
Next to Acceleration Lane	Single Lane	Short / Long	All	8-12
Ramp	Off Ramp	Short / Long	All	8-13
	On Ramp	Short / Long	All	8-14

SPECIAL LAYOUTS

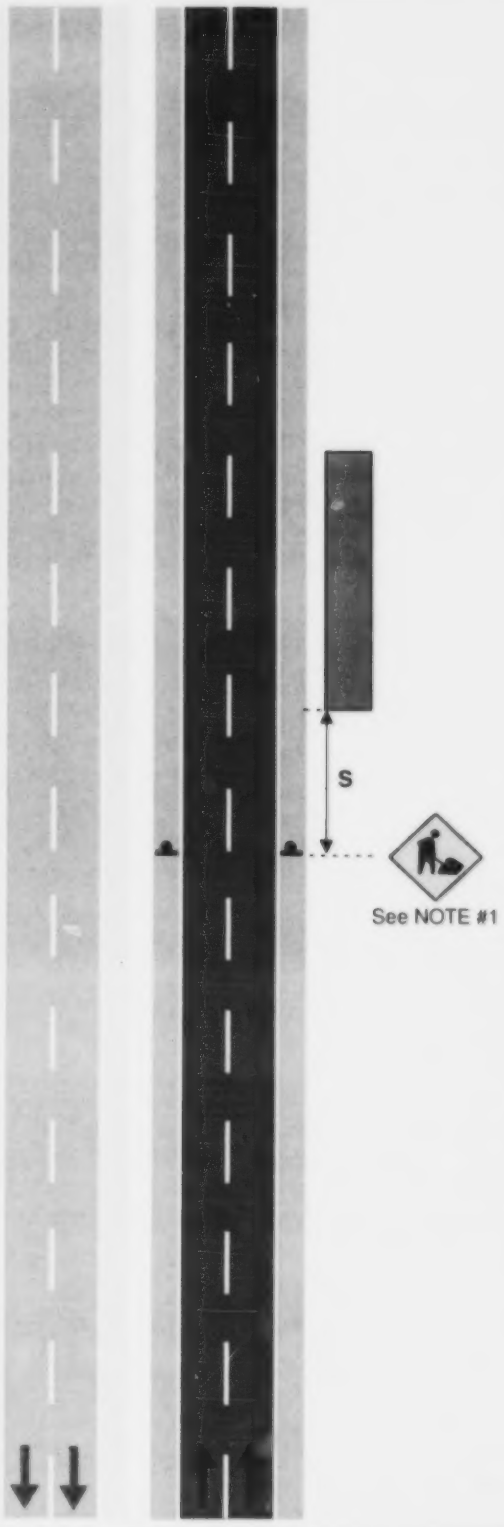
Activity	Work Location	Duration	Volume	Figure No.
Surveying	Shoulder	Short	All	8-15
Line Painting	Single Lane	Moving	All	8-16
Blasting Area				8-17
Low Shoulder				8-18
Other Hazards				8-19
After Milling or Paving				8-20
Advance Signing (Major Project)				8-21

NOTE: Use Figure 8-7 for Patching, Milling, and Paving activities.



NOTES:

1. No signs are required for work that occurs outside 15 m from the edge of the travelled lane.
2. No signs are required for mowing operations. However, the mower shall be equipped with a 360 degree amber light and a Slow Moving Vehicle Triangle.
3. For mowing operations, the first swath adjacent to the road must be mowed following the direction of traffic.
4. Shoulder must remain clear of all workers, vehicles, and equipment while work is in progress.
5. For work in the median, sign the other direction only if work is within 15 m of the opposing travel lane and no median barrier is present.



Roadside Work Any Duration All Volumes				
V	50	60-70	80-90	100-110
S	50	75	100	150

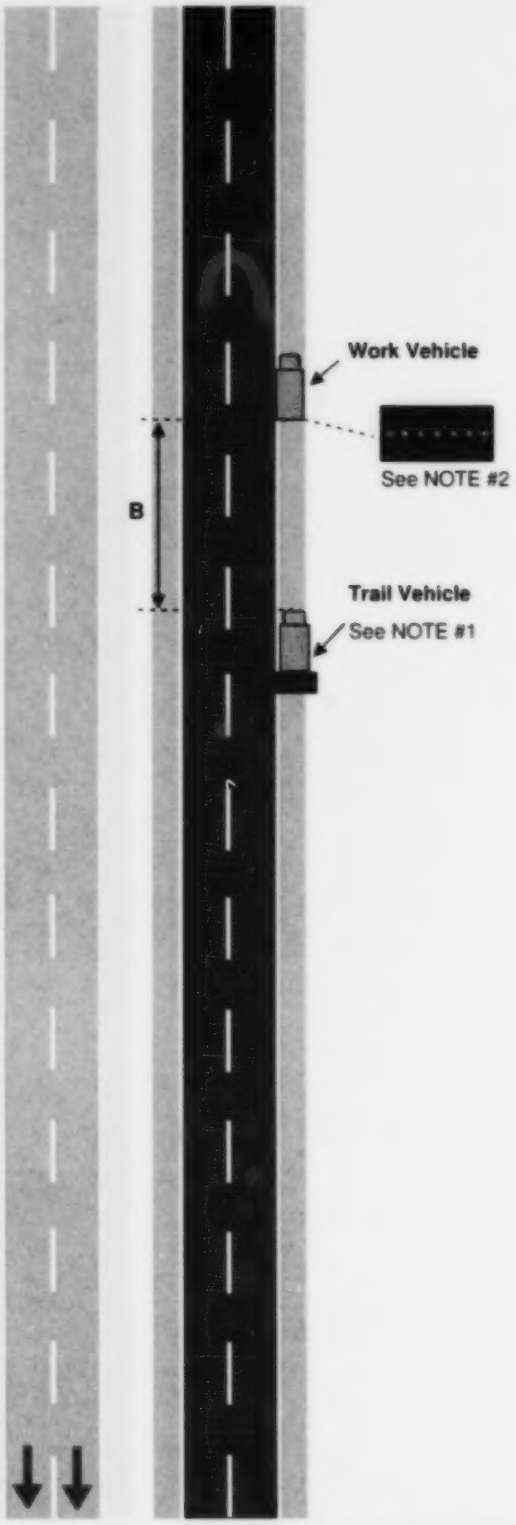
V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

Figure 8-1

NOTES:

1. Buffer Vehicle is required where there is insufficient shoulder width, causing the Work Vehicle to encroach on the travelled lane. In these instances, an additional Trail Vehicle may be used based upon site specific conditions such as restricted sight distances.
2. Flashing Arrow Boards shall display the appropriate directional arrow if vehicles encroach on the travelled lane.



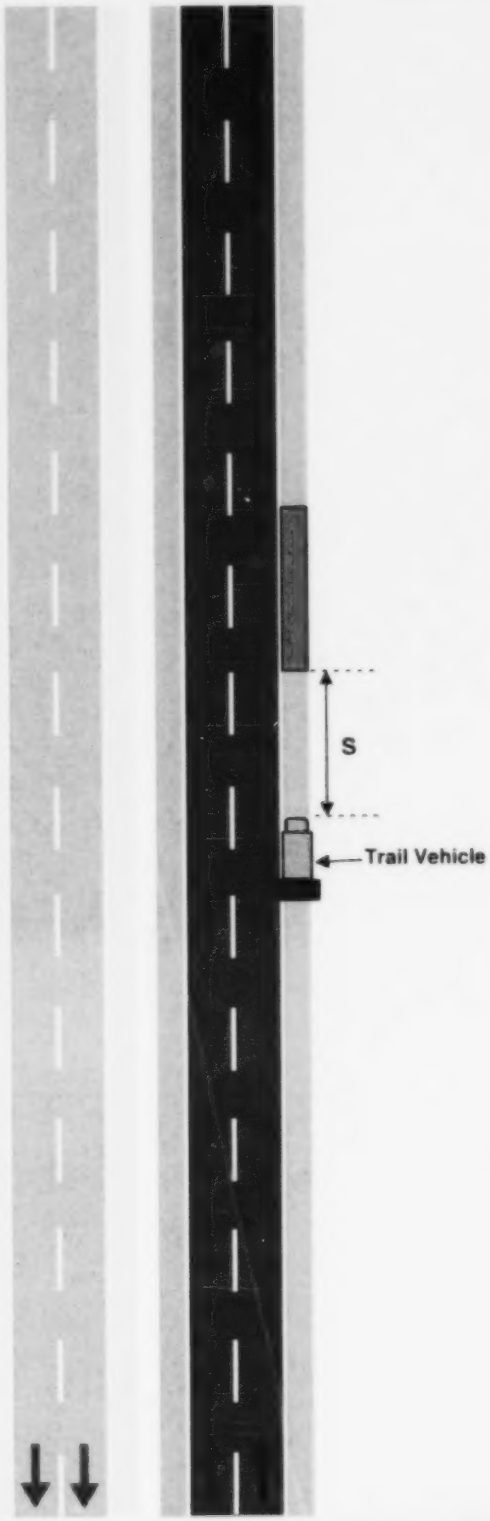
Shoulder Work , Moving Operation All Volumes				
V	50	60-70	80-90	100-110
B	35	50	65	75

V – Existing Speed Limit (km/h)

B – Buffer Distance (m)

NOTES:

1. Trail vehicle shall be equipped with a Flashing Arrow Board set to caution mode.
2. No workers, equipment, or vehicles shall encroach on the travelled lane.
3. Use Figure 8-7 if insufficient shoulder width is available.



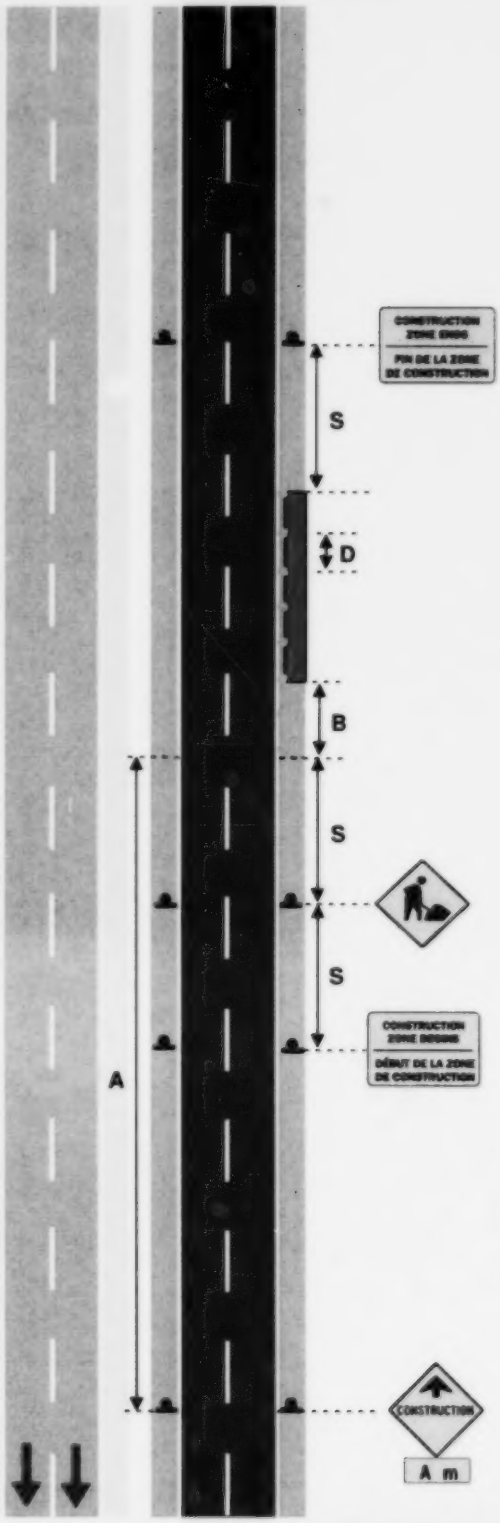
Shoulder Work Very Short Duration (less than 30 min) All Volumes				
V	50	60-70	80-90	100-110
S	50	75	100	150

V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

NOTES:

1. For work on the left shoulder, sign the other direction according to Figure 8-1 if work is within 15 m of the opposing travel lane and no median barrier is present.
2. No workers, equipment, or vehicles shall encroach on the travelled lane.



Shoulder Work
Short Duration
(greater than 30 min. less than 1 day)
All Volumes

V	50	60-70	80-90	100-110
A	300	300	500	1000
S	50	75	100	150
D	8	10	14	24
B	35	50	50	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

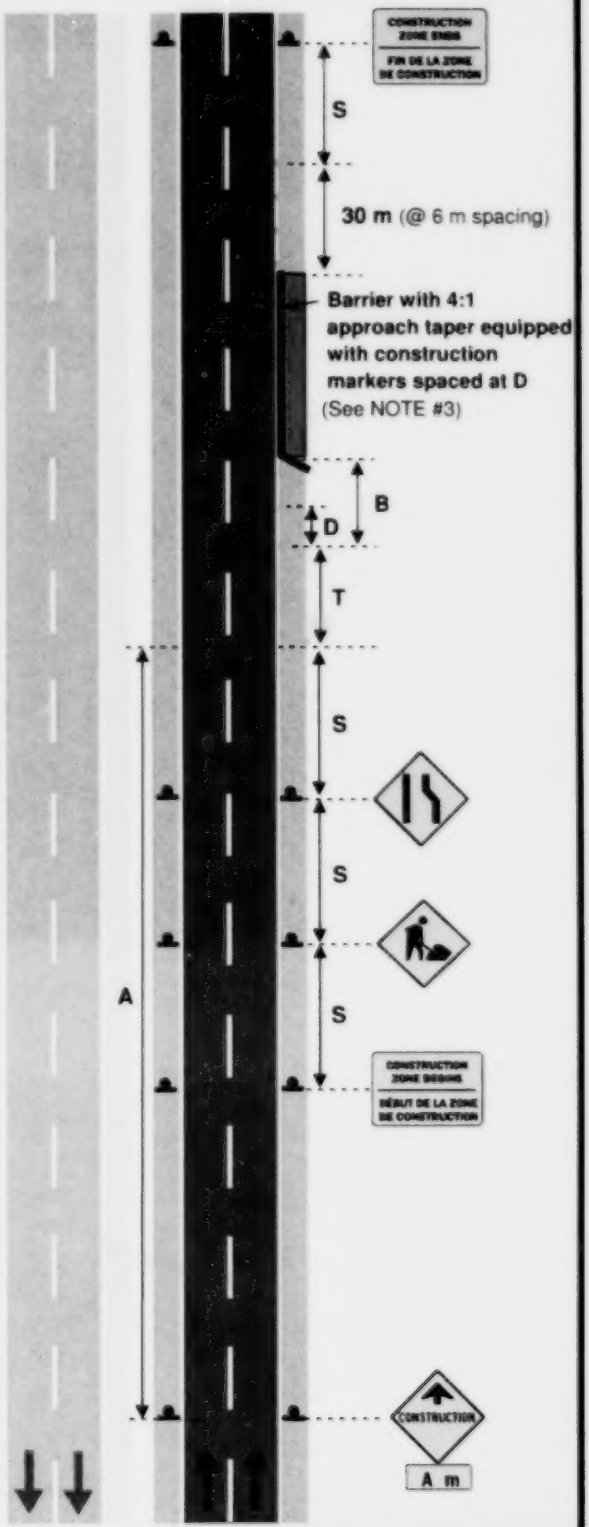
S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing (m)

B – Buffer Area Length (m)

NOTES:

1. For work on the left shoulder, sign the other direction according to Figure 8-1 if work is within 15 m of the opposing travel lane and no median barrier is present.
2. No workers, equipment, or vehicles shall encroach on the travelled lane.
3. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
4. Figure 8-9 shall be used for long duration shoulder work on bridge structures.



Shoulder Work
Long Duration
(greater than 1 day)
All Volumes

V	50	60-70	80-90	100-110
A	300	300	500	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

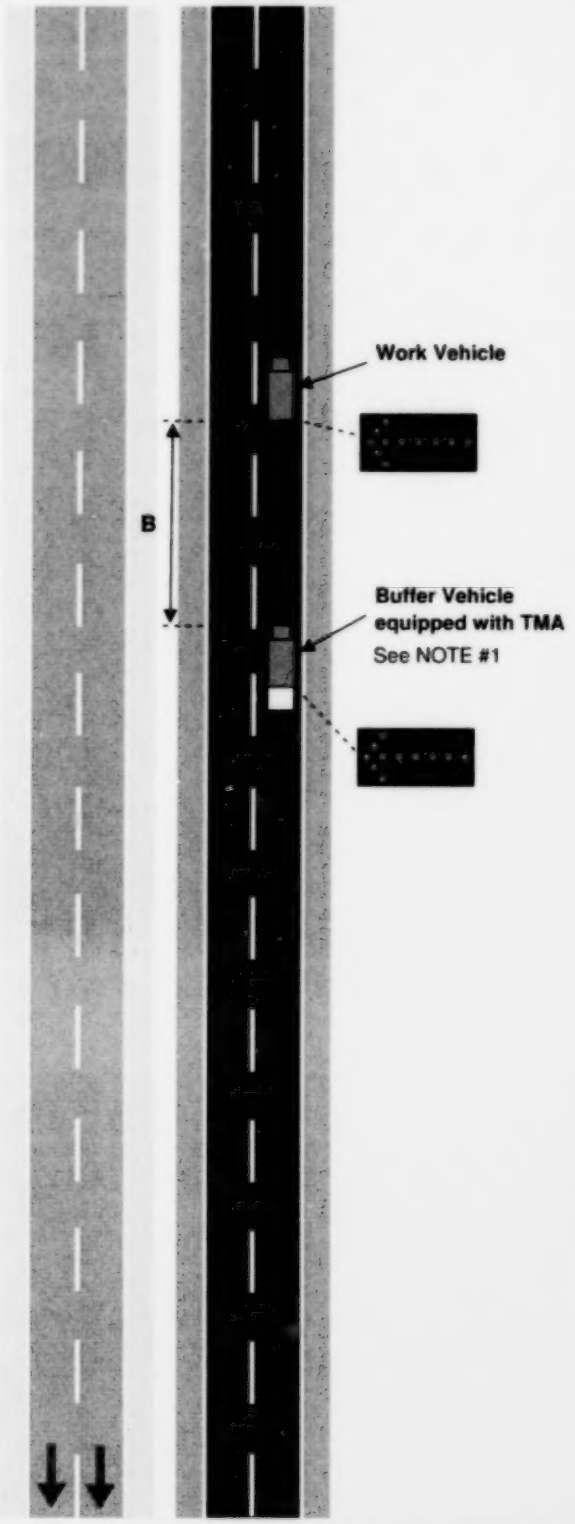
T – Taper Length (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

NOTES:

1. Buffer Vehicle not required for operations that maintain a speed within 30 km/h of the posted speed limit, except for where the work vehicle makes periodic stops.
2. An additional Trail Vehicle may be used based upon sight specific conditions such as restricted site distances.



Single Lane Closure Moving Operation All Volumes				
V	50	60-70	80-90	100-110
B	35	50	70	75

V – Existing Speed Limit (km/h)

B – Buffer Area Length (m)

NOTES:

1. For work in the left lane, sign the other direction according to Figure 8-1 if work is within 15 m of the opposing travel lane and no median barrier is present.
2. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
3. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation's Maintenance & Traffic Branch.
4. Road Work sign to be replaced by Survey Crew sign for surveying activities.
5. Delineators may be offset a maximum of 0.8 m from the centreline into the unclosed lane to accommodate patching activities.
6. Left Lane Closed Ahead sign shall be used if work is in the other lane.

MATCH LINE to Figure 8-20 (for Milling or Paving)

Single Lane Closure Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

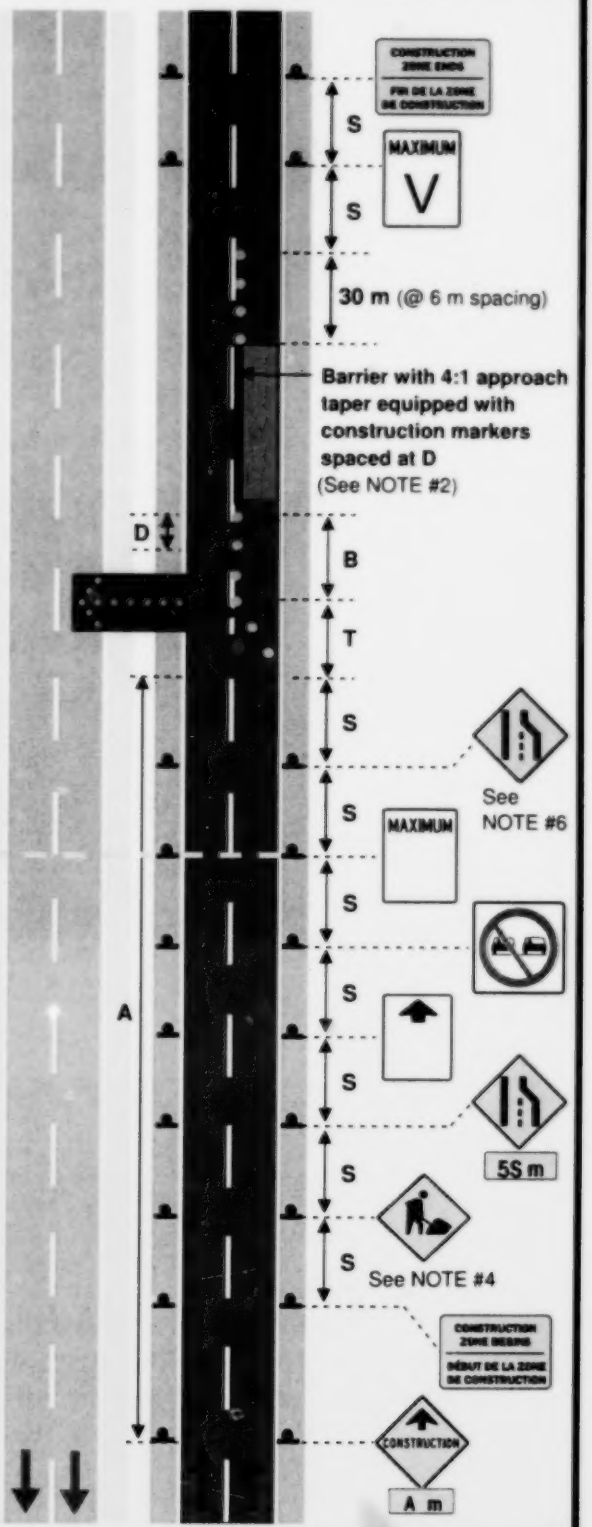
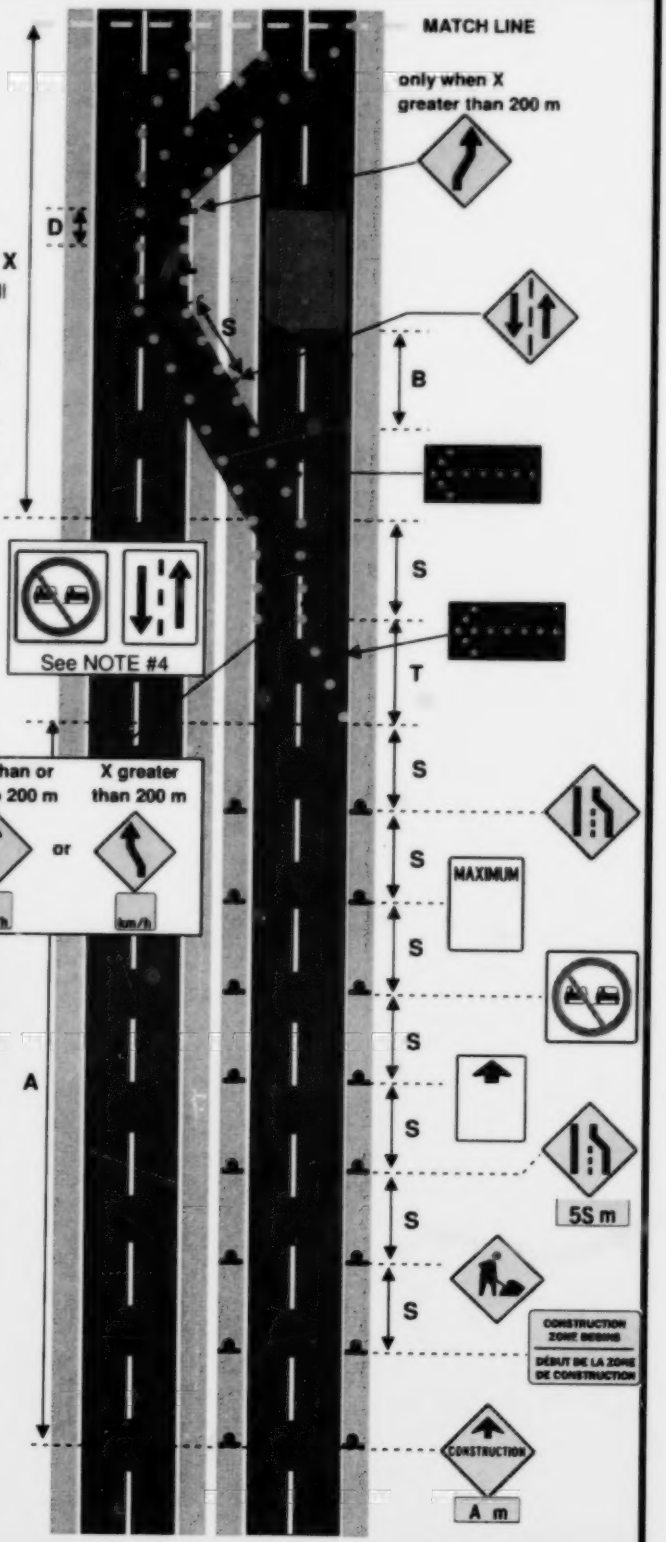


Figure 8-7

NOTES:

1. Sign opposite direction as shown in Figure 8-8b
2. X is the length of the Diversion.
3. Diversions that are planned for three days or more shall be paved.
4. Alternate Two Way Traffic sign and No Passing sign every 0.5 km of Diversion.
5. Non-applicable pavement markings shall be removed for Long Duration Work.
6. Regulatory speeds shall not be reduced more than 20 km/h.
7. Advisory speed to be determined by the Department of Transportation's Maintenance & Traffic Branch. Advisory Speed Tabs only required if the difference between the Diversion speed and the reduced speed is greater than 10 km/hr.
8. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.



Multilane Diversion Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

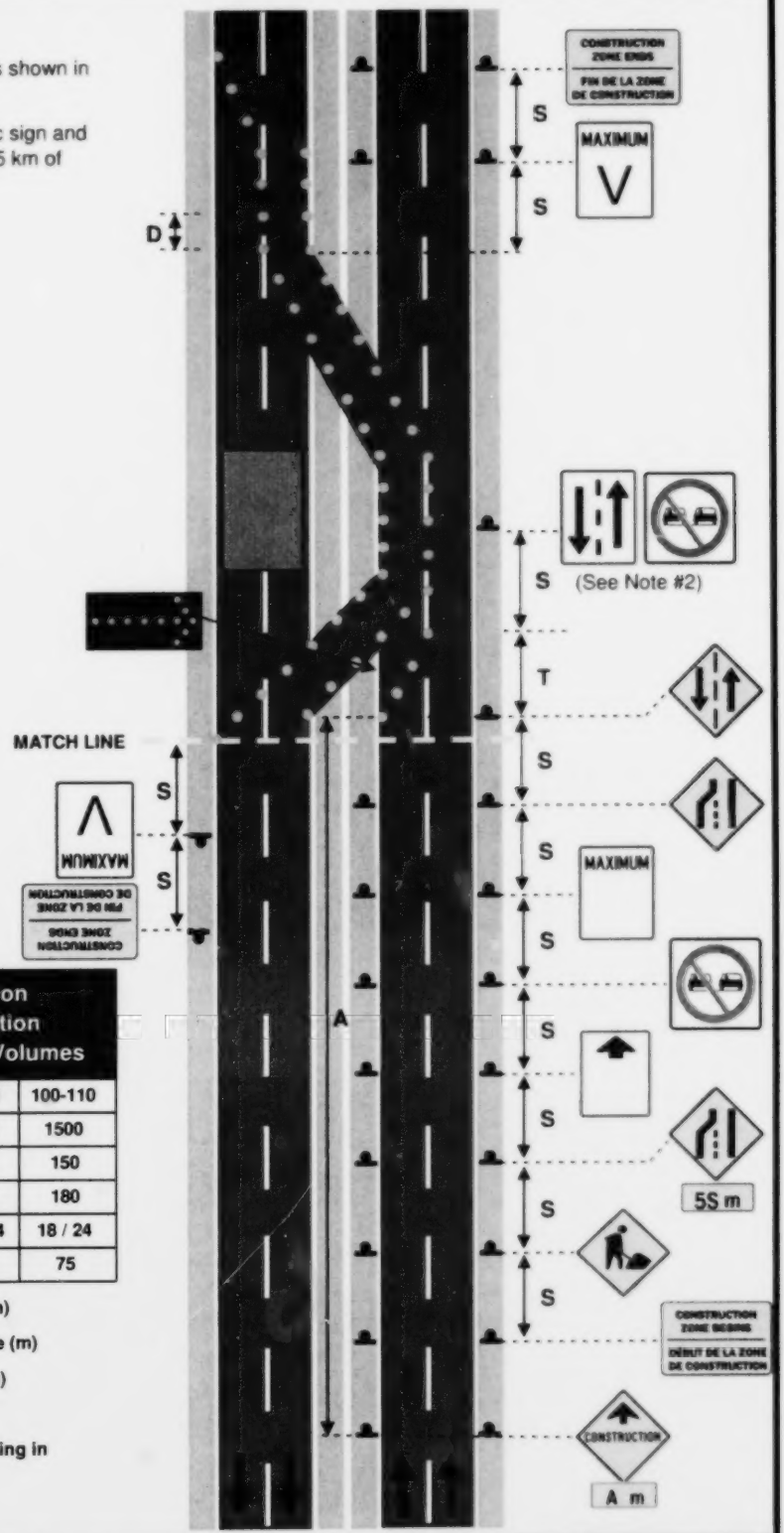
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 8-8a

NOTES:

1. Sign opposite direction as shown in Figure 8-8a.
2. Alternate Two Way Traffic sign and No Passing sign every 0.5 km of diversion



Multilane Diversion
Short / Long Duration
(greater than 30 min) **All Volumes**

V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

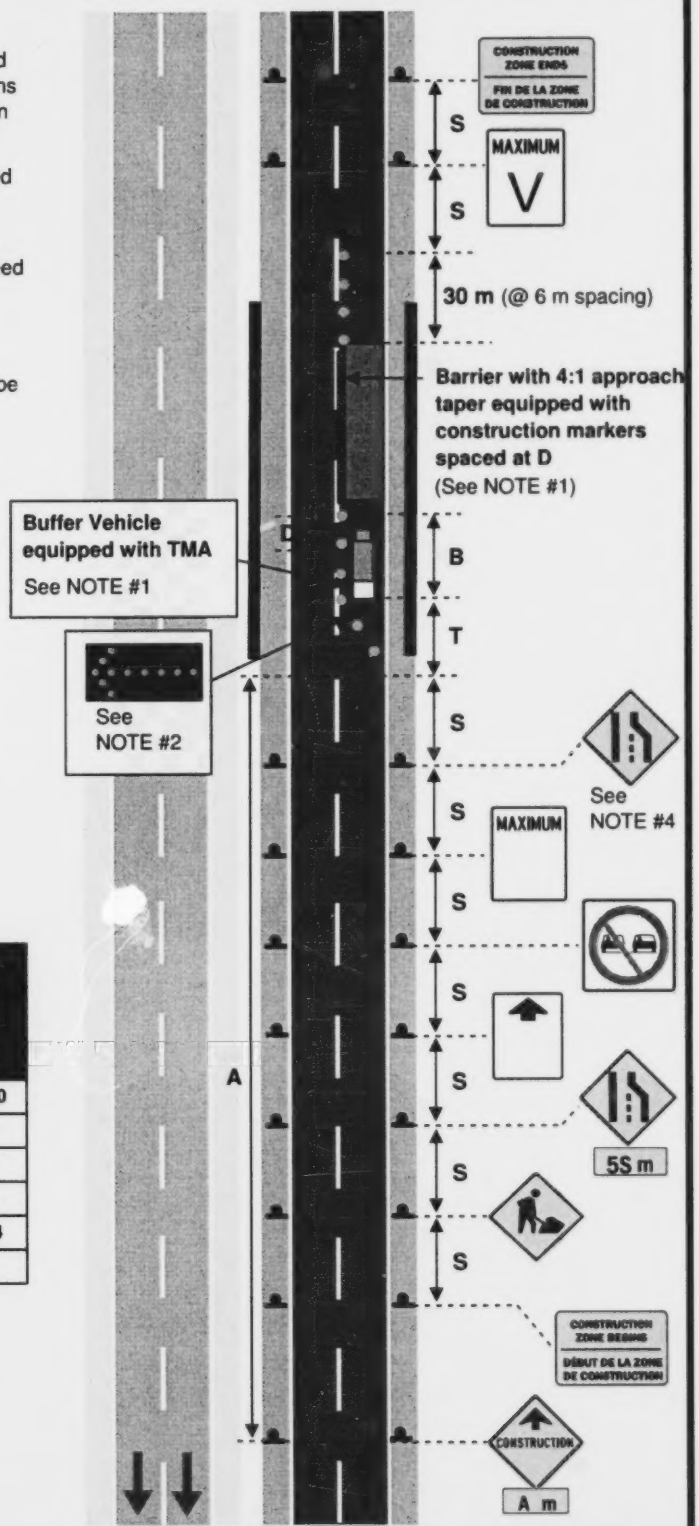
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 8-8b

NOTES:

1. Continuous Barrier may be replaced by a buffer vehicle and flexible drums or delineator posts for short duration work.
2. Flashing Arrow Board to be mounted on buffer vehicle when used.
3. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation's Maintenance & Traffic Branch.
4. Left Lane Closed Ahead sign shall be used if work is in the other lane.



Bridge (Single Lane Closure) Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

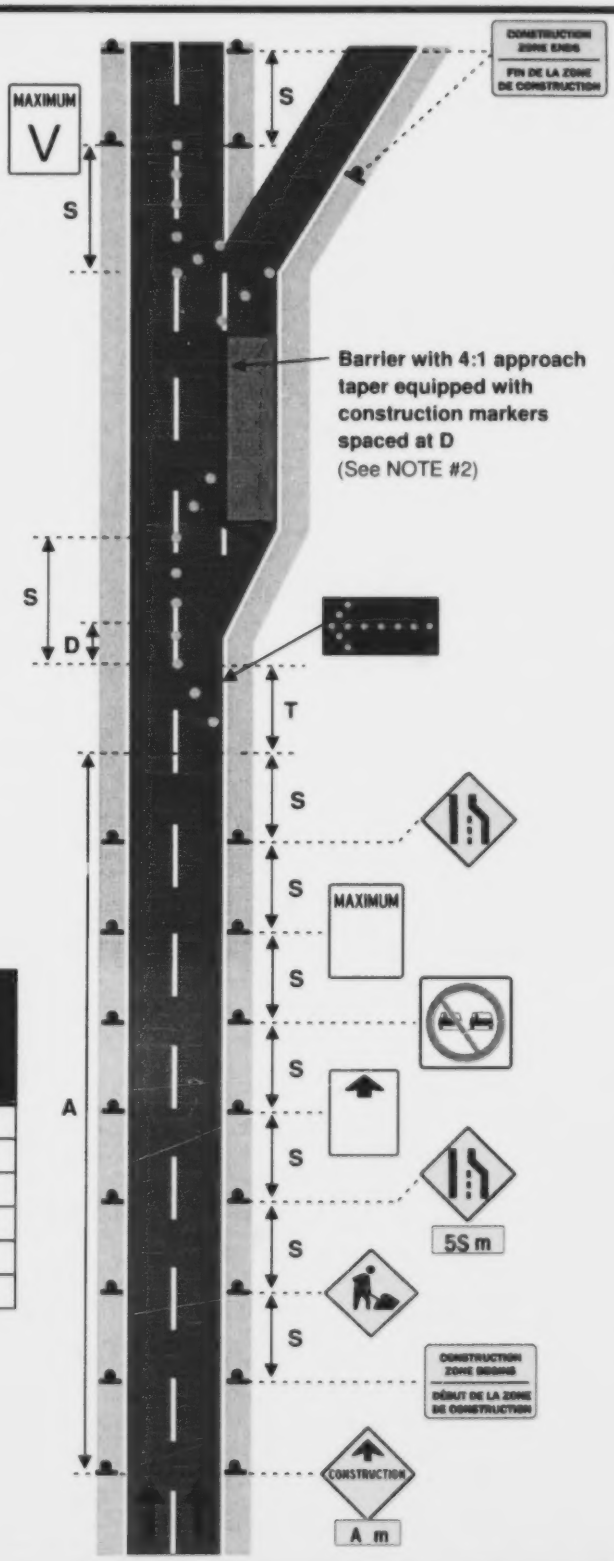
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 8-9

NOTES:

1. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation's Maintenance & Traffic Branch.
2. Continuous Barrier may be replaced by a buffer vehicle and flexible drums or delineator posts for short duration work.



Deceleration Lane Closure
Short / Long Duration
(greater than 30 min)
All Volumes

V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

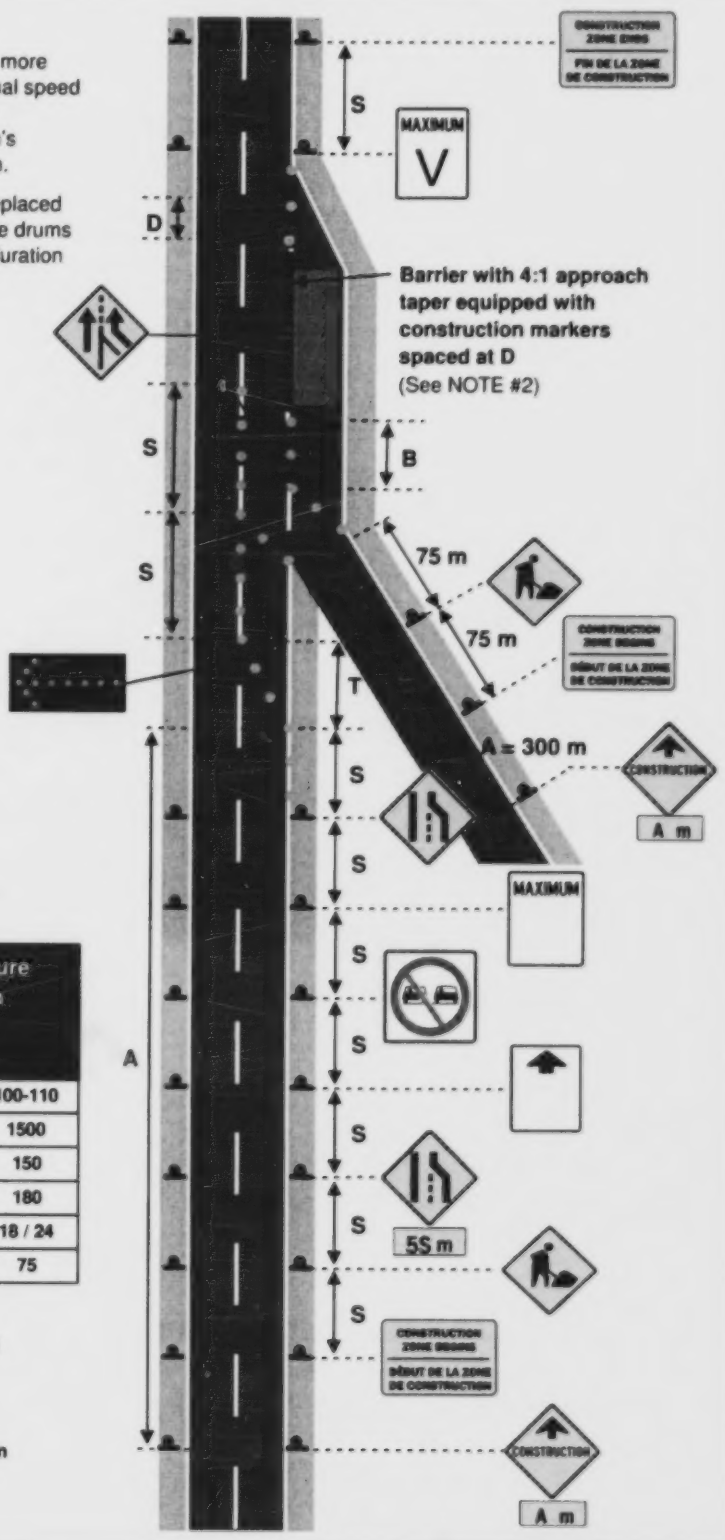
T – Taper Length (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

NOTES:

1. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation's Maintenance & Traffic Branch.
2. Continuous Barrier may be replaced by a buffer vehicle and flexible drums or delineator posts for short duration work.



Acceleration Lane Closure Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

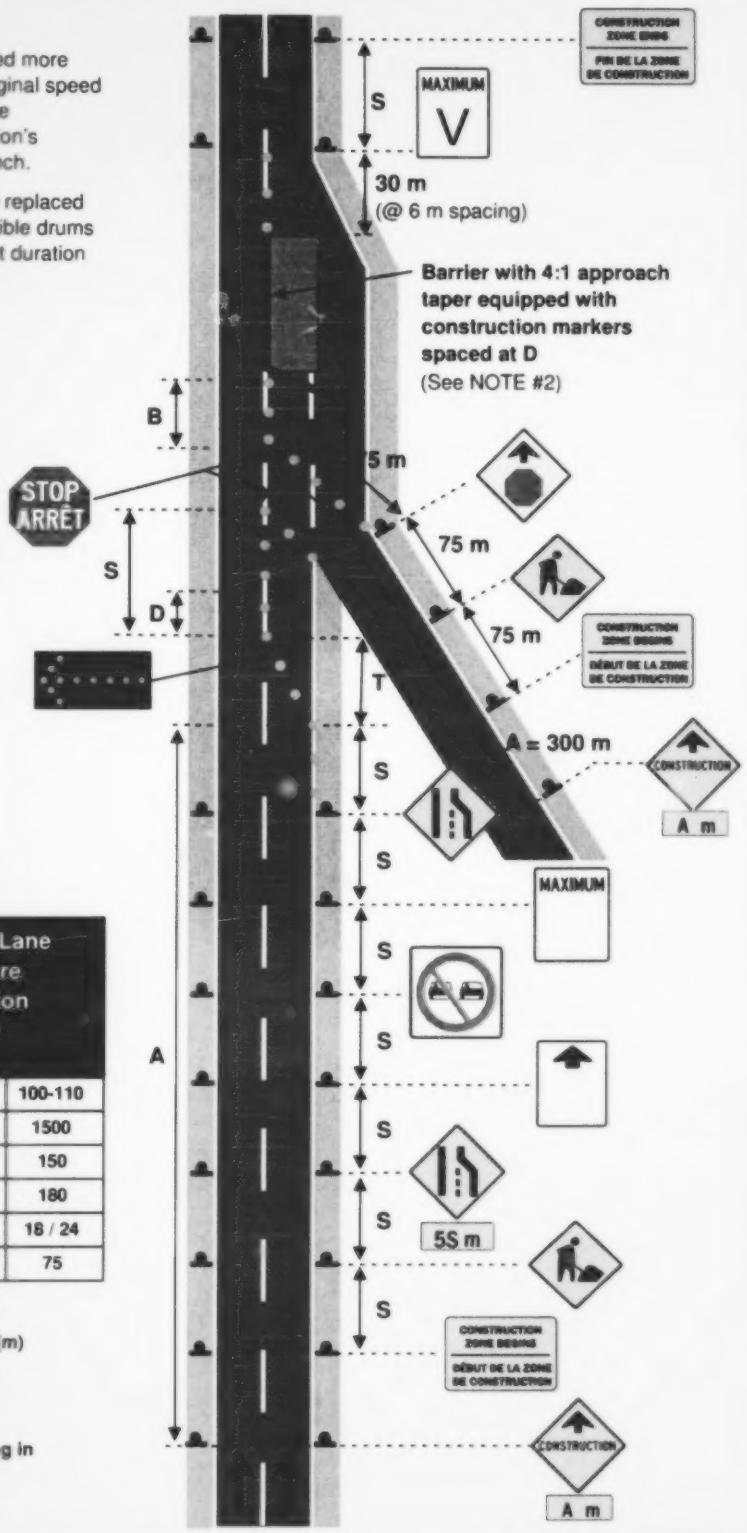
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 8-11

NOTES:

1. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation's Maintenance & Traffic Branch.
2. Continuous Barrier may be replaced by a buffer vehicle and flexible drums or delineator posts for short duration work.



Next to Acceleration Lane Single Lane Closure Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

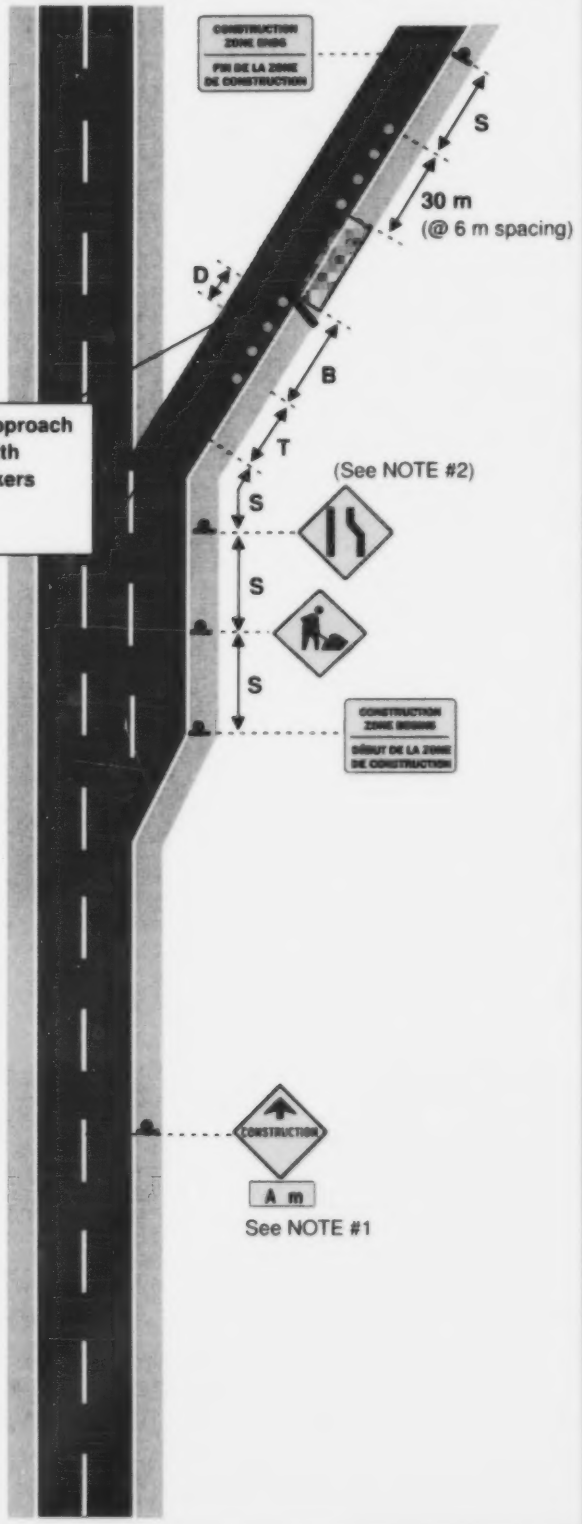
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

Figure 8-12

NOTES:

1. Minimum lane width shall be at least 2.5 m adjacent to the activity area.
2. Advisory ramp speed shall be used for determining S, T, D and B values on the ramp. If no advisory is posted, use 60-70 km/h.
3. Continuous Barrier may be replaced by a buffer vehicle and flexible drums or delineator posts for short duration work.
4. Existing advisory ramp speed may be reduced where deemed necessary.



Off Ramp (Partial Lane Closure) Short Long Duration (greater than 30 min) All Volume				
V	50	60-70	80-90	100-110
A	300	300	500	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

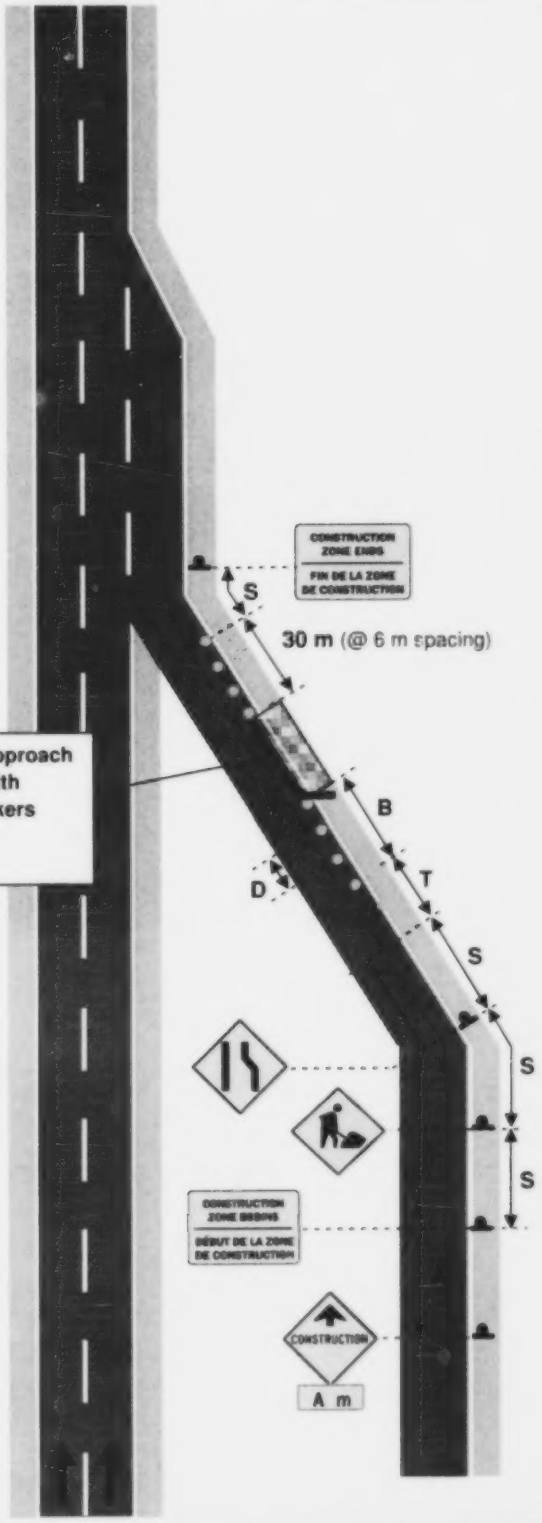
T – Taper Length (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

NOTES:

1. If the ramp is too short to provide distance "A', then Construction Ahead signs shall be placed on both approaches on the secondary road and display the appropriate directional arrows.
2. Continuous Barrier may be replaced by a buffer vehicle and flexible drums or delineator posts for short duration work.
3. Minimum lane width shall be at least 2.5 m adjacent to the activity area.
4. If ramp speed is not posted, use 60-70 km/h for selecting A, S, T, D and B.



On Ramp (Partial Lane Closure) Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	300	300	500	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

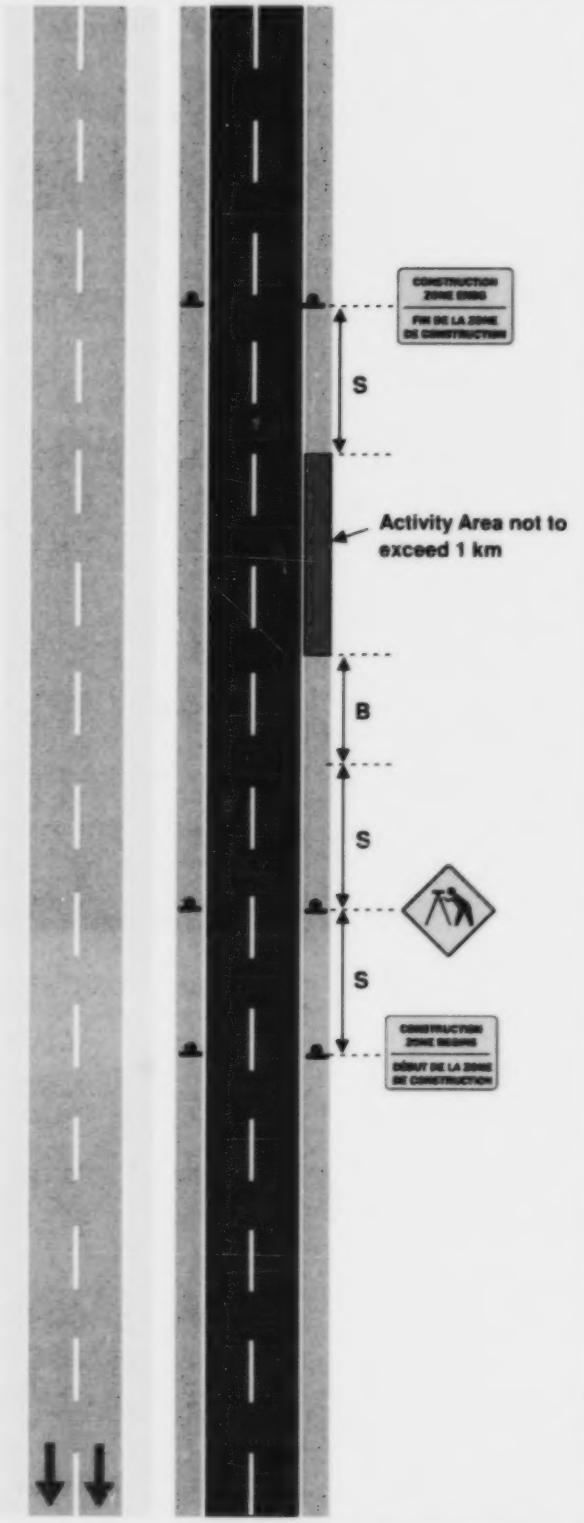
T – Taper Length (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

NOTES:

1. For work on the left shoulder, sign the other direction according to Figure 8-1 if work is within 15 m of the opposing travel lane and no median barrier is present (except replace road work sign with survey crew sign).
2. No workers, equipment, or vehicles shall encroach on the travelled lane.
3. A Dedicated Traffic Observer shall be used for survey activities that require occasional trips onto or across the travel lanes. Figure 8-7 shall be used for survey activities carried out primarily in the travelled lane.



Surveying (Shoulder) Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100-110
S	50	75	100	150
W	10	20	30	50

V – Existing Speed Limit (km/h)

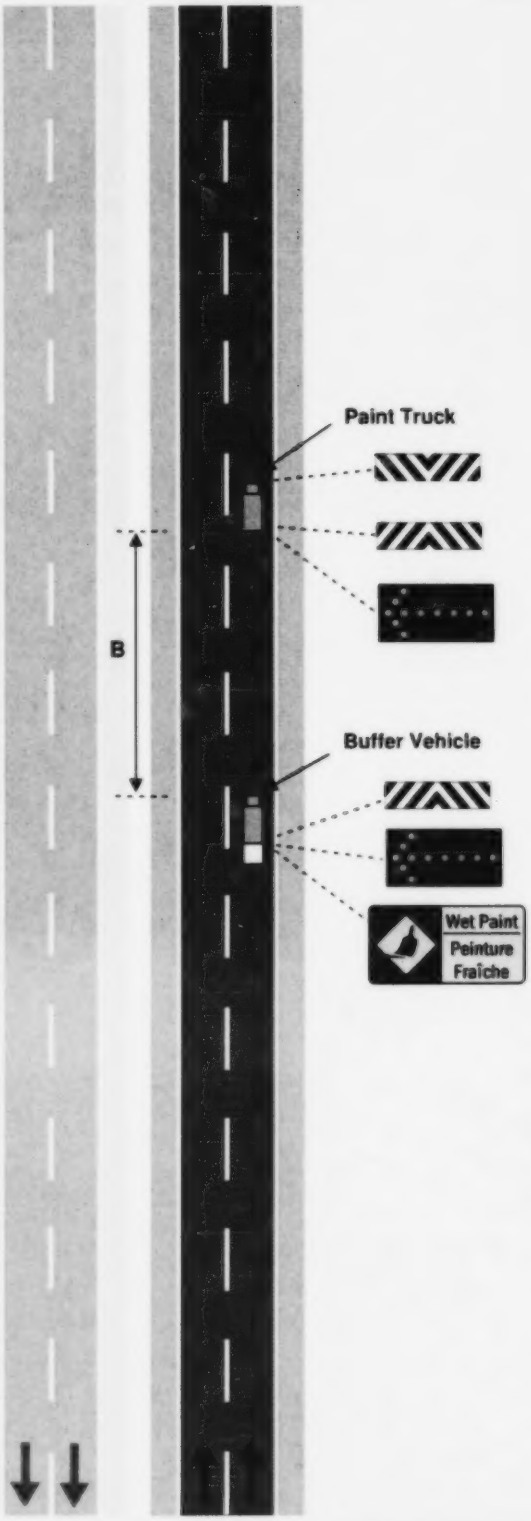
S – Minimum Sign Spacing (m)

B – Buffer Area Length (m)

Figure 8-15

NOTES:

1. Paint Truck and Buffer Vehicle to display right arrow when working in the right lane travelled lane.
2. An additional trail vehicle may be utilized to control tracking.



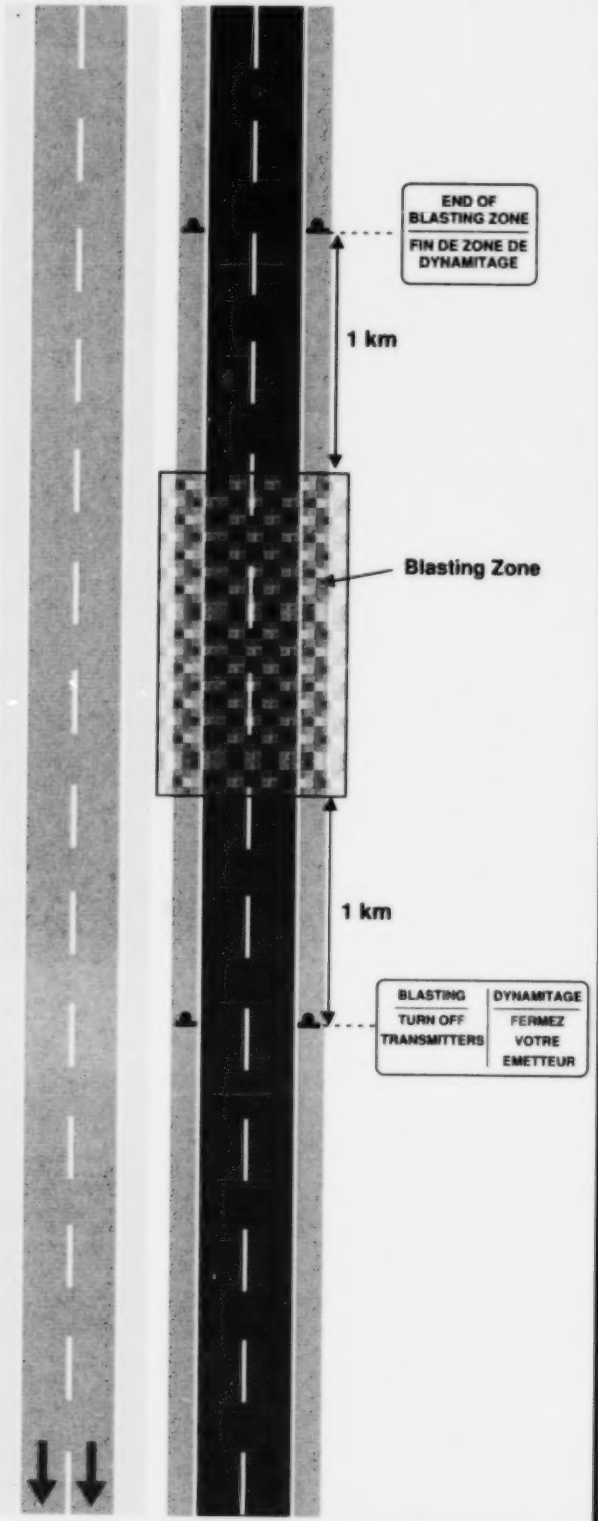
Line Painting Moving Operation All Volumes				
V	50	60-70	80-90	100
B	35	50	70	75

V – Existing Speed Limit (km/h)

B – Buffer Distance (m)

NOTES:

1. Sign opposite direction in the same manner.

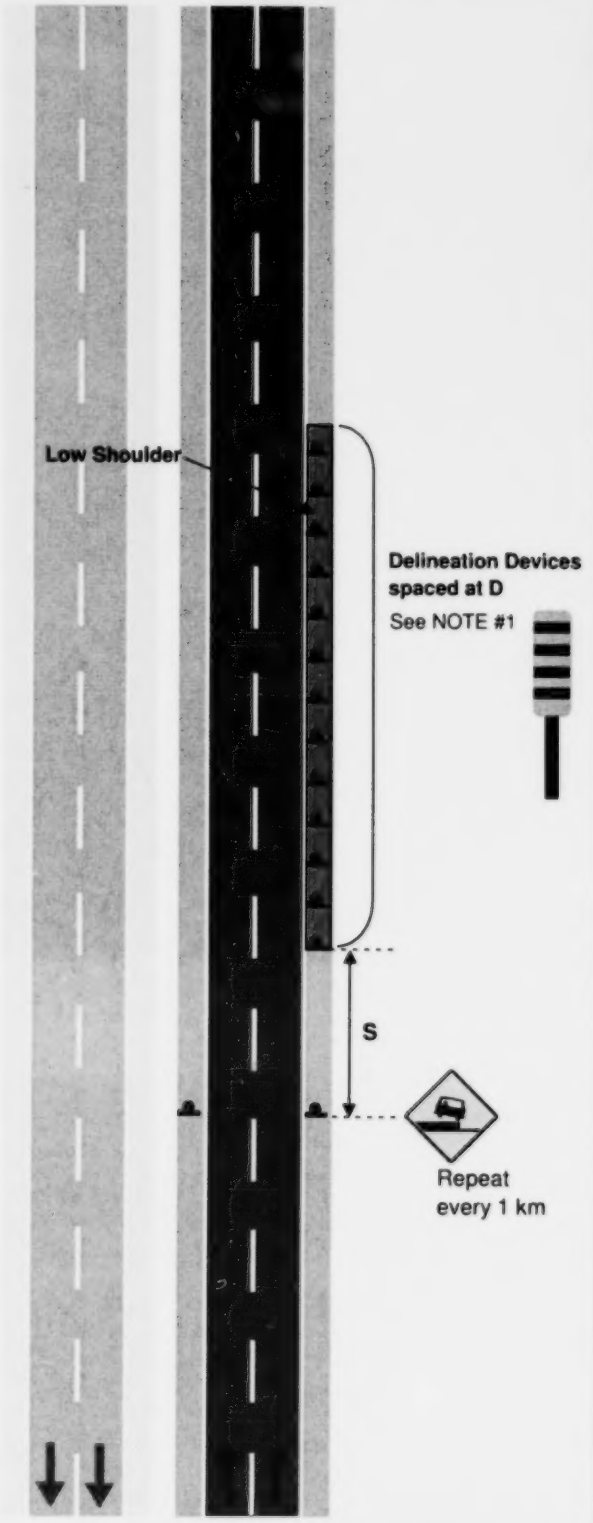


Blasting Area
Any Duration
All Volumes

Figure 8-17

NOTES:

1. Delineation Devices only required where the difference in elevation between the travelled lane and the shoulder is greater than 75 mm.



Low Shoulder Any Duration All Volumes				
V	50	60-70	80-90	100-110
S	50	75	100	150
D	8	10	14	24

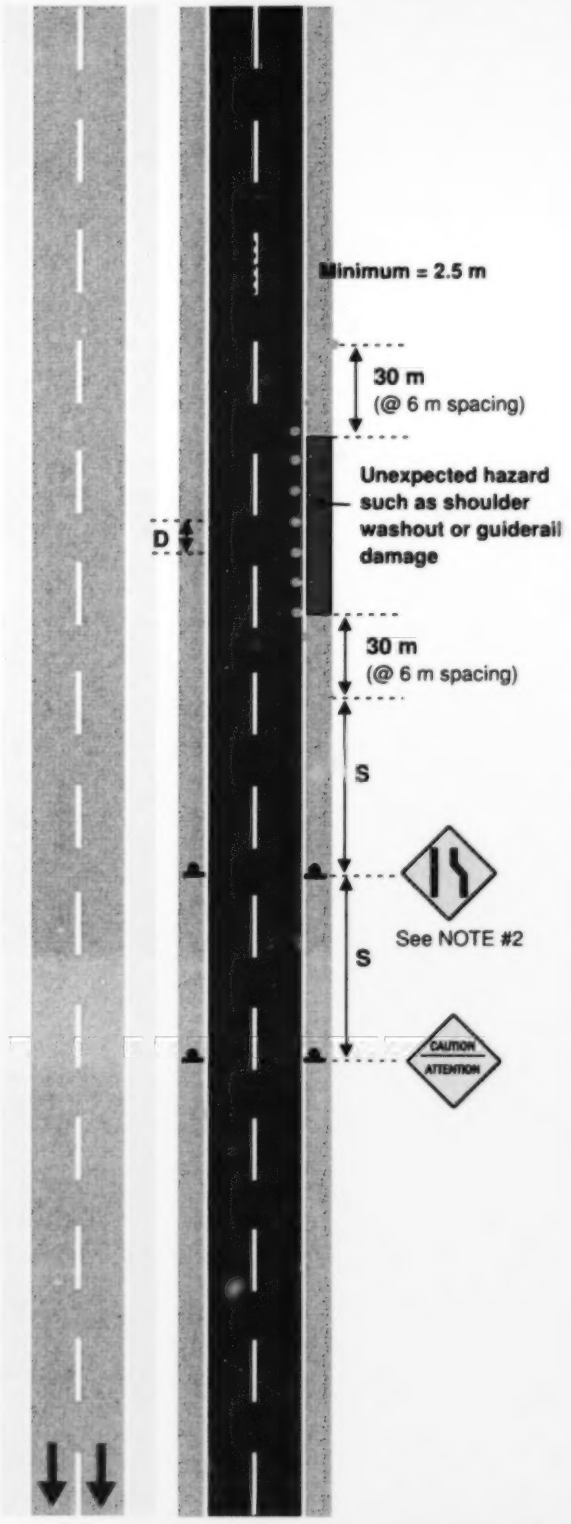
V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing (m)

NOTES:

1. This layout shall only be used to delineate the hazard until it can be fixed, at which time an appropriate layout such as Figure 8-3, 8-4, or 8-5 must be used.
2. Use Left Road Narrows sign if hazard is on the left shoulder.



Other Hazards Any Duration All Volumes				
V	50	60-70	80-90	100-110
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24

V – Existing Speed Limit (km/h)

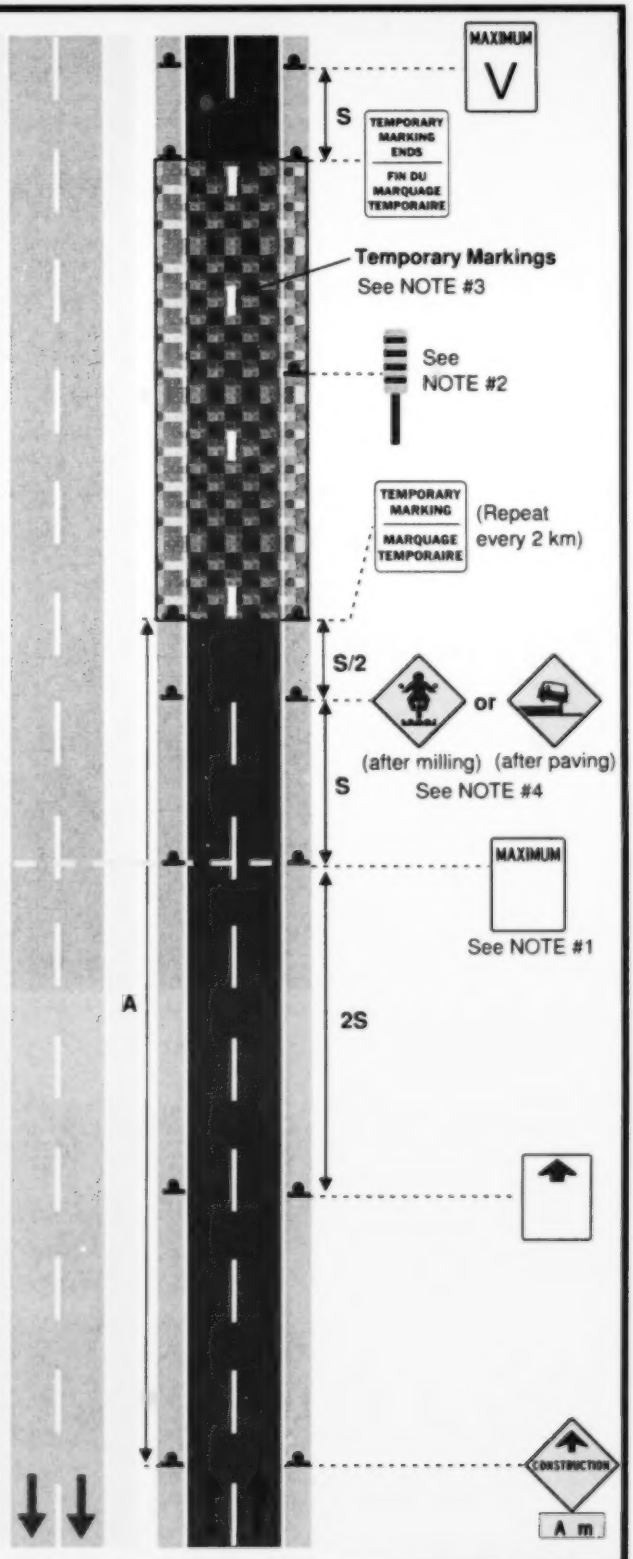
S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

Figure 8-19

NOTES:

1. Speeds shall be reduced to a maximum of 80 km/h on all milled surfaces with normal speed limits of 90 km/h or greater.
2. Delineation Devices only required where the difference in elevation between the travelled lane and the shoulder is greater than 75 mm.
3. Pavement marking tape (or paint) shall be applied in 2 m strips and spaced at 50 m on tangents and 25 m or curves. Raised pavement markers shall be installed in groupings of three within a 2 m length and be spaced the same as pavement marking tape.
4. Repeat appropriate sign every 1 km of milled or paved surface.
5. If milling involves full depth removal, then Grooved Pavement sign shall be replaced by Pavement Ends sign.
6. Bump signs shall be used any time there is a differential in surface thickness on the main lanes.



MATCH LINE to Figure 8-7

After Milling or Paving Any Duration All Volumes				
V	50	60-70	80-90	100-110
A	300	500	1000	1000
S	50	75	100	150

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

Figure 8-20

NOTES:

1. Do not repeat Construction Ahead or Construction Zone Begins.
2. Only use sign when applicable.
3. When merging Figure 8-21 with other typical layouts, the distance A shall be referenced to the same location as in the accompanying layout.

Advance Signing (Major Project) Long Duration All Volumes				
V	50	60-70	80-90	100
A	500	1000	1500	2000
S	50	75	100	150

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

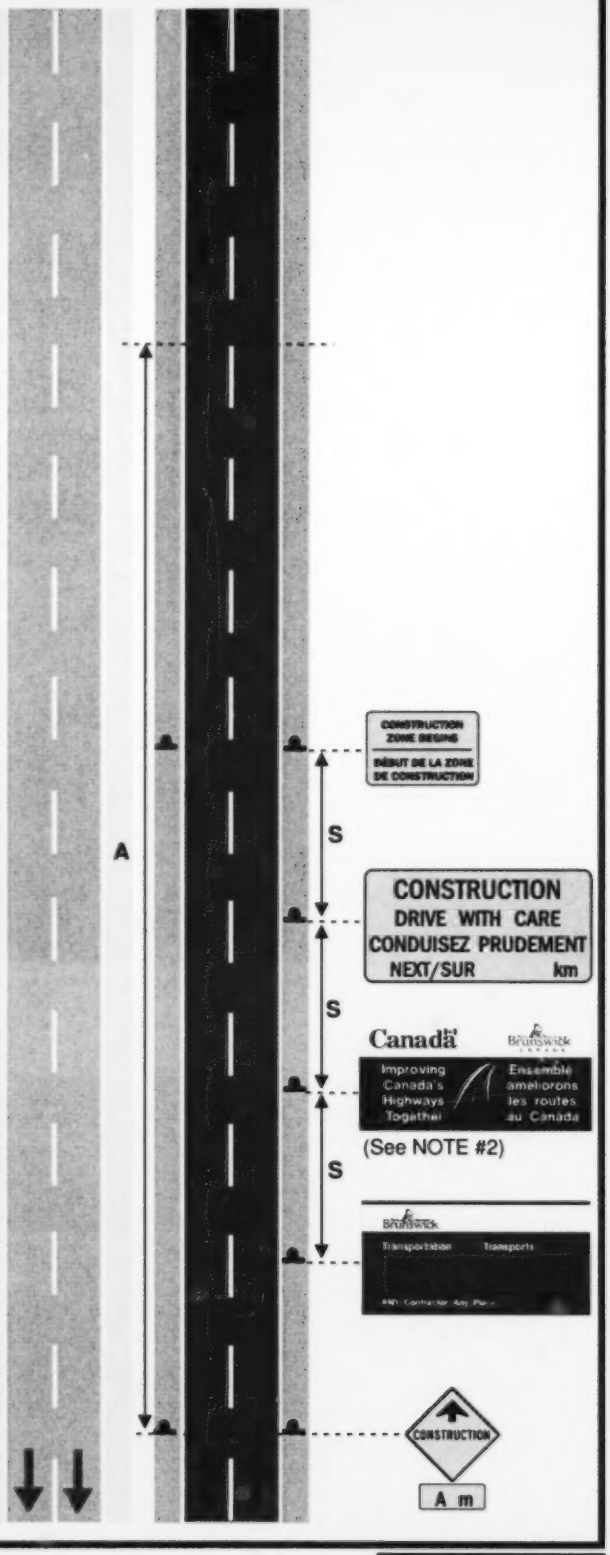


Figure 8-21